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NEW GENERA AND SPECIES OF NEANURINEA (COLLEMBOLA) FROM EAST AFRICA.

By J. T. Salmon, D.Sc., F.R.S.N.Z., F.R.E.S.
(*Victoria University College, Wellington, New Zealand.*)

The material recorded in this paper comes from collections made in East Africa during January and February, 1949, by Dr. George Salt, Zoology Department, Cambridge University. I am indebted to Dr. Salt for the opportunity to work over these most interesting collections. The present paper deals with the Neanurinae only, and includes descriptions of two new genera and five new species, together with a redescription of *Pseudachorudina mabirensis* (Philiptschenko).

The illustrations herein may be used to obtain the relative sizes of the various parts according to the scale given with each set of figures. The magnification given is that at the exit pupil of the microscope, and is *not* the actual magnification of the printed figure, though this discrepancy does not affect in any way the determination of relative proportions of, say, the claw and mucro of a given species.

Subfamily Neanurinae.

Tribe Brachystomellini.

Setanurida gen. n.

Mandibles and maxillae both present, toothed, but mandible without molar area; ocelli 7 or 8 to each side, postantennal organ, unguiculus, furcula and anal spines all absent; setae simple, sparse, except round posterior of body where there are sometimes numerous strongly clavate setae, some of which are relatively long; clavate tenent hairs present on tibiotarsus; ant. IV with large apical retractile knob; sense organ present on ant. III; cuticle fine to medium granulated.

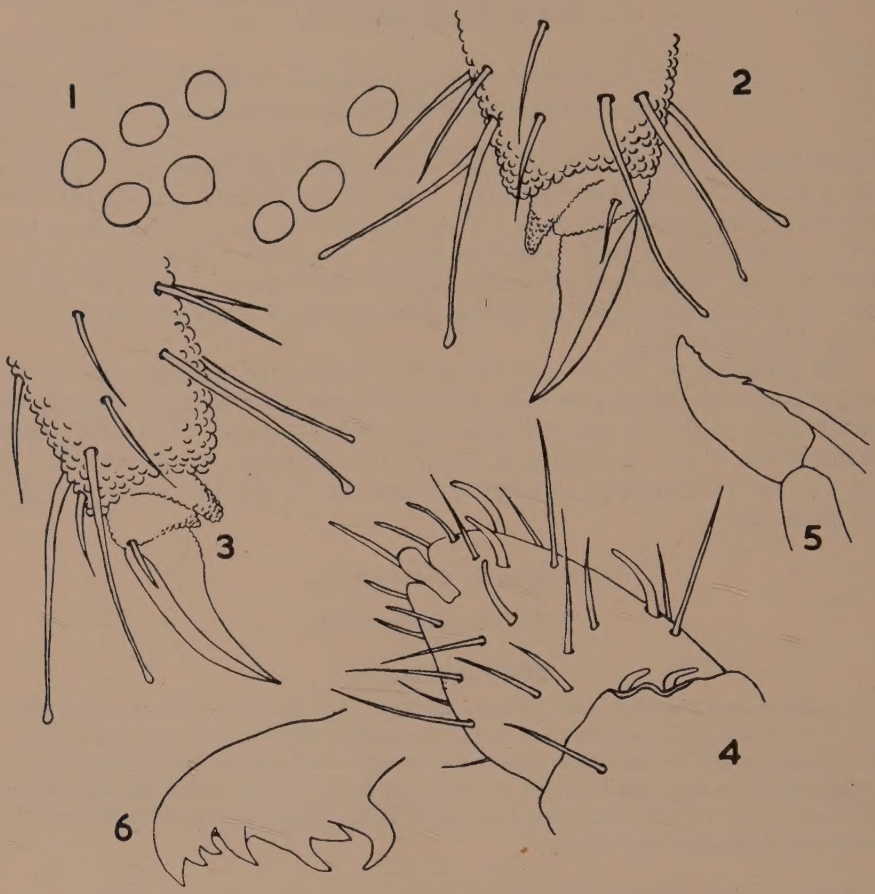
Type species: *Setanurida salti* sp. n.

This genus is related on the one hand to *Setanodosa* from New Zealand on account of the clavate setae, but on the other hand to *Pseudanurida* through the presence of the mandibles. The clavate setae, however, show no petal-like structure as in *Setanodosa*. Two species can, at present, be placed in this genus.

Setanurida salti sp. n. (figs. 1–6).

Colour: Entirely black. *Clothing:* Occasional short, curved, simple setae anteriorly, longer and more numerous posteriorly where many are clavate; setae of the antennae and legs long, simple, not clavate. *Body:* Length up to 1·4 mm. Mandible reduced with 3 vestigial apical teeth and a single recurved tooth at centre; maxilla well developed, expanded, with 7 prominent teeth. Antennae with segments III and IV incompletely fused; the four segments related as 20 : 22–23 : 14–16 : 12–14; apex ant. IV with large

retractile sensory knob in deep pit, four stout curved sense rods and several more slender straight sense rods (fig. 4); sense organ of ant. III with two strongly bent sense rods behind a cuticular fold (fig. 4). Ocelli 8 to each side, equal, in two groups of 5 and 3 respectively. Abd. IV to abd. III as 16 : 14. Cuticle granulate. *Legs:* Claw without any teeth, but with base finely tuberculate; three long external clavate tenent hairs and a



Figs. 1–6.—*Setanurida salti* sp. n. (1) Ocellar group, left side. (2) Hind foot. (3) Fore foot. (4) Ant. IV and apex ant. III. (5) Mandible. (6) Maxilla. *Scale:* Figs. 2–5, at the microscope, × 700; fig. 6, × 1260; fig. 1, × 560.

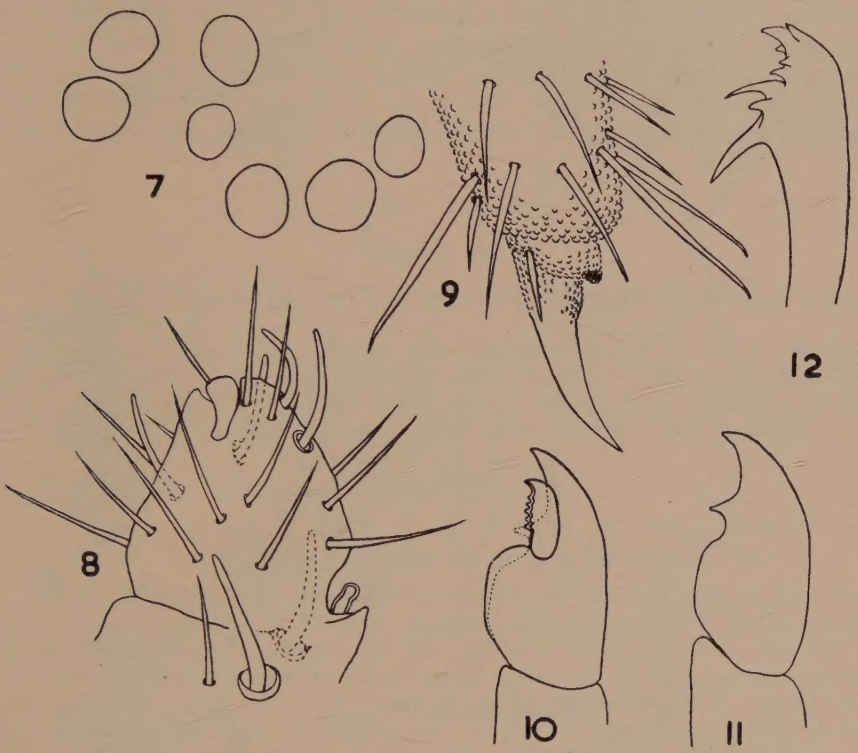
pair of long internal clavate tenent hairs, all arising from same level on tibiotarsus (figs. 2–3); base of claw finely granulate and with a long basal seta to each side. On the fore feet the central external tenent hair is often reduced to a short seta (fig. 3).

Holotype in the British Museum (Natural History) from Uganda: Ruwenzori, Mt. Speke, 15,500 ft., in soil sample.

Paratypes in the British Museum (Natural History), Museum Comparative Zoology, Harvard, U.S.A., and in author's collection from the same locality as holotype and from Ruwenzori, Mt. Baker, 15,250 ft., in soil sample.

Setanurida nigrissima sp. n. (figs. 7–12).

Colour : Entirely black. *Clothing :* Of short, simple setae, sparse ; clavate setae absent. *Body :* Length up to 1 mm. but mostly from 0·5 mm.–0·75 mm. Mandible with one backwardly directed tooth and a secondary lamella bearing a row of five teeth. Maxilla with 8 teeth, the posterior one being very large and backwardly directed. Antennae subequal to head in length with segments III and IV partially fused ; ant. I : ant. II : ant. III + IV as 30 : 33 : 52. Ant. IV with two pairs of large, bent, apical sense rods and large sensory knob in pit (fig. 8) as in *S. salti* ; ant. III with two very large sub-apical sense rods, much longer and stouter than those on ant. IV and each provided with a pro-



FIGS. 7–12.—*Setanurida nigrissima* sp. n. (7) Ocellar group, left side. (8) Ant. IV and apex ant. III. (9) Hind foot. (10) Mandible showing lamella on dorsal side. (11) Mandible from ventral side. (12) Maxilla. *Scale :* All figures drawn to same magnification at the microscope, × 1260.

minent cuticular pocket around its base ; sense organ of ant. III in deep cuticular pocket and consisting of two very stout bent sense rods ; antennae bearing also numerous long plain setae. Ocelli 7 to each side, subequal. Abd. IV longer than abd. III as 72 : 33. Cuticle medium to finely granulated. *Legs :* Claw without any teeth but with long stout basal seta to each side ; claw base tuberculate. A single long external non-clavate tenent hair and two long internal lightly clavate tenent hairs to each foot.

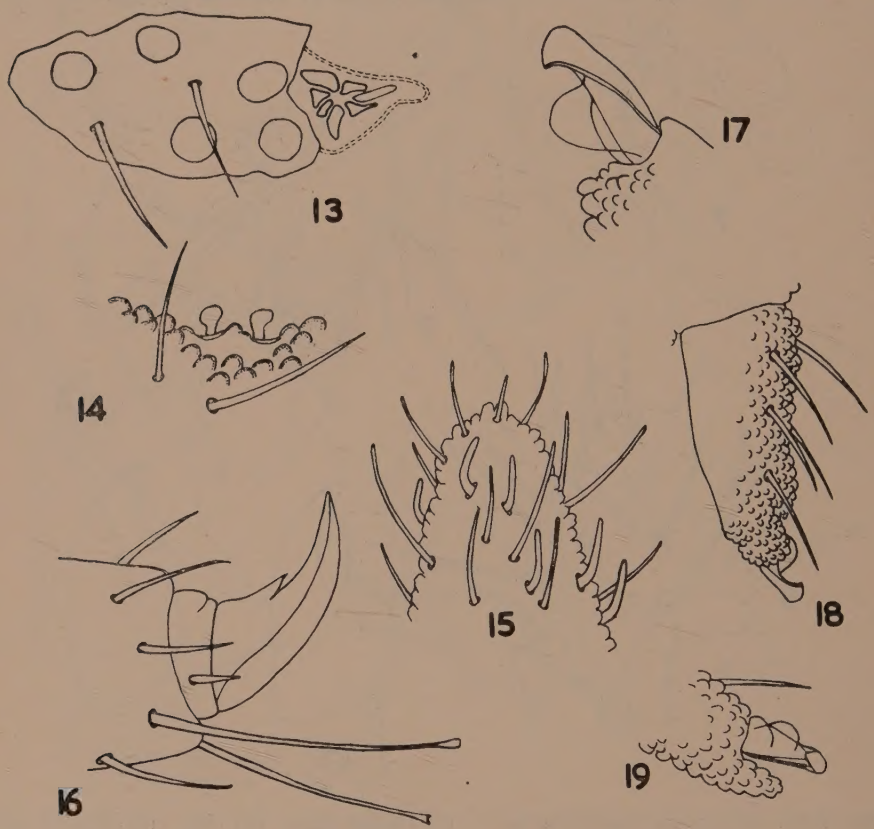
Holotype and paratype in British Museum (Natural History) from EAST AFRICA : Mt. Kenya, 15,500 ft., in soil samples by Curling Pond.

Paratypes in author's collection and Museum of Comparative Zoology, Harvard, U.S.A.

Odontella Schaeffer, 1897.

Odontella septemlobata sp. n. (figs. 13–19).

Colour : Pale blue, granular, dorsally and laterally ; paler blue to whitish ventrally and on legs and furcula ; antennae darker blue ; ocellar fields very dark blue. *Clothing :*



FIGS. 13–19.—*Odontella septemlobata* sp. n. (13) Ocellar group and postantennal organ, right side. (14) Sense organ of ant. III. (15) Apex of ant. IV showing sense rods. (16) Hind foot. (17) Mucro. (18) Dens and mucro. (19) Lobe of dens with mucro. *Scale :* At microscope, figs. 13, 15, 19, × 700 ; figs. 14, 16, 17, × 1260 ; fig. 18, × 400.

Sparsely clothed with short simple setae. *Body :* Length 1·2 mm. Antennae shorter than head, the four segments related as 15 : 15 : 18 : 27 ; apex ant. IV with two large tubercles, 6 to 7 stout bent sub-apical sense rods and numerous sensory setae ; sense organ ant. III with a pair of short sense clubs behind cuticular fold and a third exposed sense club well removed to one side, and below the pair. Ocelli 5 to each side, subequal in two groups of 3 and 2 respectively. Postantennal organ with 7 irregular, uneven lobes arranged to fill a triangle with sides equal in length to about twice the diameter of an

ocellus. Cuticle finely granulate and tuberculate. Anal spines no larger than cuticular granules and very difficult to see, sharply pointed, at least 2, possibly 3 in number. *Legs :* Claw with single large inner tooth at one-third to one-half down, no outer teeth, a medium length basal seta to each side ; two lightly clavate tenent hairs longer than claw to each foot. *Furcula :* Manubrium 27, dens 25, mucro 8 ; dens with 5 posterior setae ; mucro arising subapically from dens with single bulbous apical tooth, broad sub-apical semi-circular lamella passing back almost to base, and a further smaller basal lamella on outer edge.

Holotype in British Museum (Natural History) from UGANDA : Ruwenzori, Mt. Baker, 15,250 ft., in soil sample, a single specimen only.

This species may, when more specimens are found, prove to require a new genus on account of the seven-lobed post antennal organ and the number of anal spines possibly being in excess of two. For the present, however, with only one specimen available for study, I think it is best regarded as an *Odonella.*

Tribe : Anuridini

Kenyura gen. n.

Closely allied to *Paranura* of Axelson from which it differs in the presence of a rudimentary furcula.

Mandible toothed, without molar area; maxilla needle-like. Ant. IV with trilobed apical papilla and many sense rods, some of which are extremely large. Furcula reduced, stumpy ; tenaculum with two barbs on each ramus, corpus without setae. Postantennal organ, unguiculus and anal spines all absent. Ocelli two to each side, widely separated.

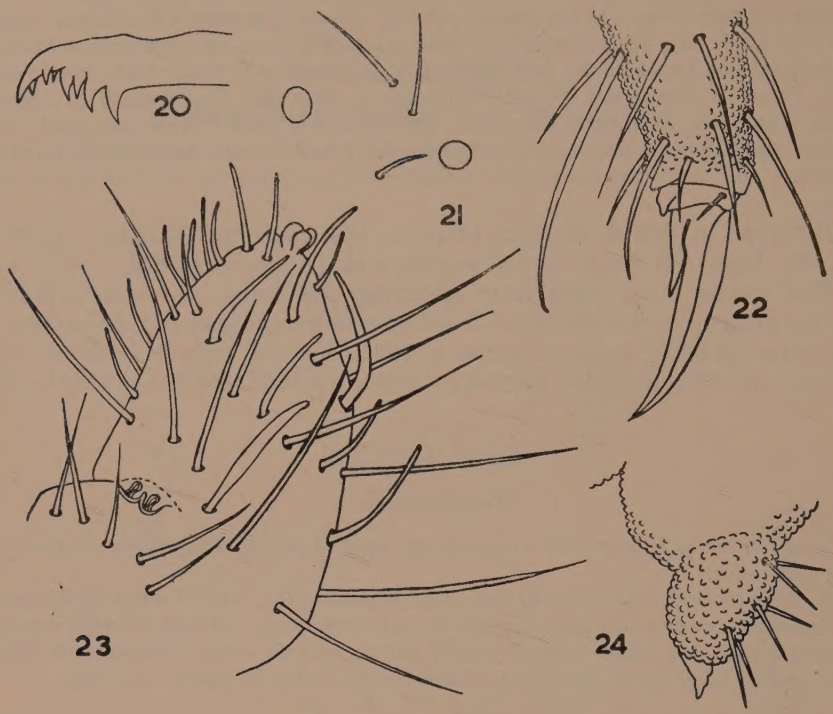
Type species : *Kenyura multisensa* sp. n.

Kenyura multisensa sp. n. (figs. 20–24).

Colour : Entirely black. *Clothing :* Sparsely clothed with both short and long simple setae. *Body :* Length up to 1·9 mm. Antennae subequal to head in length, segments III and IV indistinctly separated, the four segments related as 7 : 7 : 7 : 14 ; ant. IV with three apical knobs, three very large curved subapical sense rods and one extra large basal sense rod near to the sensory organ of ant. III which consists of two stout sense rods behind cuticular fold ; in addition, ant. III and IV carry numerous medium sized, curved sense rods intermingled with many more slender, shorter, straighter sense rods ; setae of the antennae mostly very long. Mandible strongly toothed (fig. 21), maxilla needle-like. Ocelli small, two to each side, equal, widely separated, about 4–5 times their diameter apart and without the usual pigmented fields. Thoracic and abdominal segments all distinct with suggestions of pleural areas. Cuticle finely granulate. *Legs :* Claw with single long inner tooth only, about two-fifths down, no outer teeth, a slender basal seta to each side ; a single faintly clavate tenent hair, shorter than claw, on external face and a further similar tenent hair, much longer than claw, on the internal face of each tibiotarsus. *Furcula :* Manubrium to mucrodens as 17 : 15 ; dens very stout, half as wide as length of hind claw, and with six setae on posterior face ; mucro reduced with pointed apex.

EAST AFRICA : Mt. Kenya, 15,500 ft., in soil sample by Curling Pond.

Holotype in British Museum (Natural History) ; paratype in author's collection.



FIGS. 20–24.—*Kenyura multisensa* sp. n. (20) Mandible. (21) Ocelli of right side. (22) Hind foot. (23) Ant. IV and apex ant. III. (24) Furcula. *Scale :* All figures drawn to same magnification, at the microscope, × 560.

Tribe : Pseudachorudini.

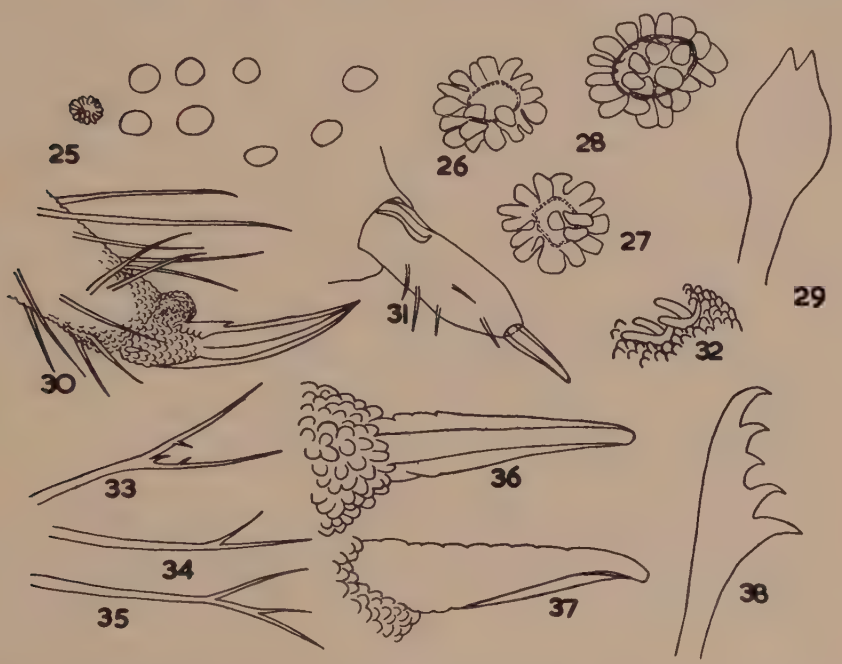
Pseudachorudina Stach, 1949.

Pseudachorudina mabirensis (Philiptschenko), 1926. (Figs. 25–38).

The collection contained two specimens which I consider are correctly identified as belonging to this species, first described in 1926 by Philiptschenko, from Mabira in East Africa. My specimens are much larger than Philiptschenko's, one reaching a length of 4·5 mm. with a breadth of 2 mm., but they agree with his description in most other details. The mucrones are not as markedly indented as shown in Philiptschenko's original figure, but they are wedge-shaped and about half the length of the dens. The four postantennal organs of my two specimens are all different. Those of one specimen show, on one side, 13 peripheral and 3 internal lobes (fig. 27), while the corresponding organ on the other side shows 15 peripheral and 3 internal lobes (fig. 26). In the other specimens the corresponding figures are 17 peripheral and 7 internal (fig. 28) ; 17 peripheral and 8 internal. This specimen with the 17 peripheral lobes has a postantennal organ almost intermediate between the rosette or elliptical form and the cluster form typical of several genera of the Pseuda-

chorudini. It would appear, therefore, that the species *P. mabirensis* is more variable than would be apparent from Philiptschenko's original description, and the species should now be removed from the genus *Pseudachorutes* to the genus *Pseudachorudina*, making the first record of this latter genus from the African continent. A more adequate description of the species can now be given as follows :

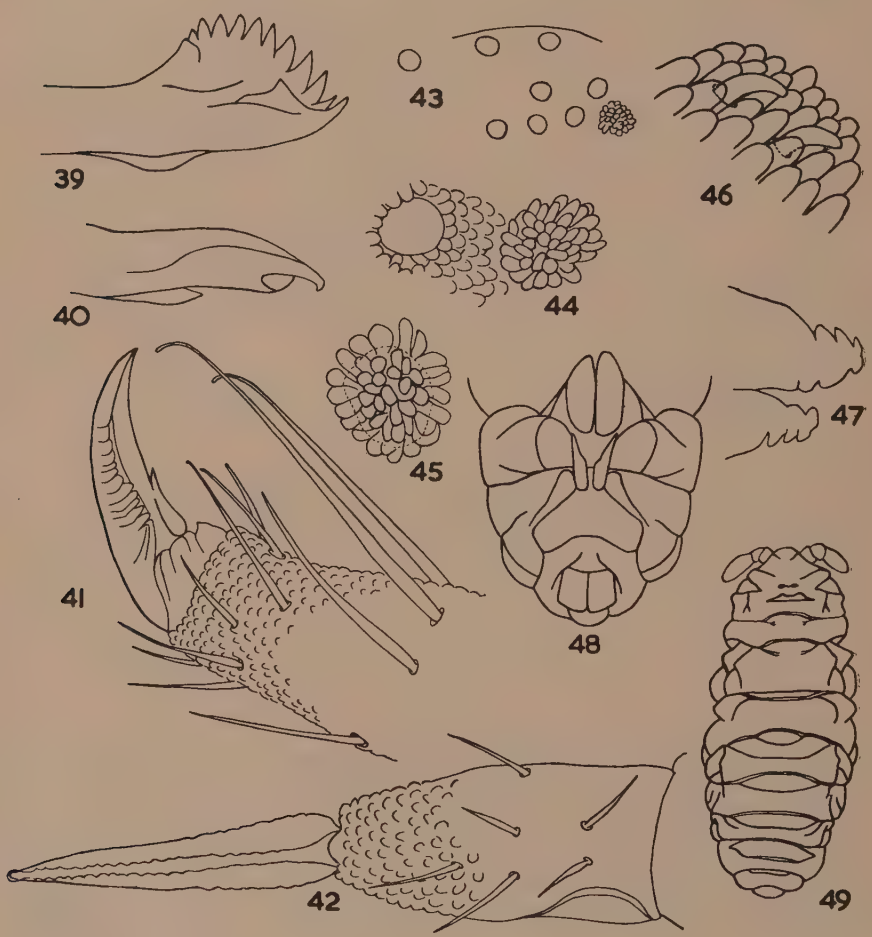
Colour : Entirely black. *Clothing :* Mostly sparse, of short, simple setae, except for posterior ventral and lateral regions where some setae are longer and forked, either doubly or singly, or forked and spined. This setal structure occurs only on some specimens, apparently the males. *Body :* Length up to 4·5 mm. width to 2 mm. Ants. III and IV



Figs. 25–38.—*Pseudachorudina mabirensis* (Philiptschenko), 1926. (25) Ocellar group and postantennal organ, left side. (26) Postantennal organ, left side. (27) Postantennal organ, right side, same specimen as fig. 26. (28) Postantennal organ, right side of another specimen. (29) Maxilla. (30) Front foot. (31) Dens and mucro. (32) Sense organ ant. III. (33) Posterior ventral seta forked and spined. (34) Posterior ventral seta with single fork. (35) Posterior ventral seta with double fork. (36) Posterior face of mucro. (37) Lateral face of mucro. (38) Mandible. *Scale :* At the microscope, figs. 25, 30, 31, 33–35, all × 140 ; all other figures × 560.

completely fused, the antennal segments related as 20 : 25 : 50. Apex of antenna with 3 apical knobs and 6–8 long apical setae ; sensory organ of ant. III with two almost straight sense rods (fig. 32). Ocelli 8 to each side, subequal ; postantennal organ with 12–17 peripheral lobes and 3–7 internal irregularly arranged lobes. Cuticle strongly tuberculate and finely granulate. Rami of tenaculum each with 4 barbs, corpus without setae. Mandible strongly toothed (fig. 38) ; maxilla bulbous with two apical teeth (fig. 29). Female genital aperture oval with numerous short curved setae covering the adjacent

cuticular ridges. *Legs:* Claw with single internal tooth at one third down, no outer teeth but a lateral basal spine to each side; claw base coarsely tuberculate with large, dome-like basal swelling on inner surface (fig. 30); fore and middle feet with two long non-clavate tenent hairs on inner face and sometimes a shorter hair between them nearer to the claw base; hind feet with three similar long tenent hairs in line across inner face of tibio-tarsus. *Furcula:* Short; dens to mucro as 65 : 27; dens with 5 setae on posterior face and with cuticular tubercles larger than those of the body. Mucro basally coarsely tuberculate, wedge-shaped, with slightly recurved blunt apex, the posterior face with



Figs. 39–49.—*Aethiopella ugandensis* sp. n. (39) Mandible. (40) Maxilla. (41) Hind foot. (42) Dens and mucro. (43) Ocellar group and postantennal organ, left side. (44) Postantennal organ and adjacent ocellus, left side. (45) Postantennal organ, right side. (46) Sense organ, ant. III. (47) Rami of tenaculum. (48) Ventral surface of posterior segments of abdomen. (49) Whole insect, dorsal aspect. *Scale:* At the microscope, figs. 41–43, × 80; fig. 46, × 720; fig. 48, × 140; fig. 49, × 20; all other figures × 400.

two lamella-like ridges passing back from the apex, the basal lateral regions faintly crenulate (figs. 36–37).

Uganda : Ruwenzori, above Lake Bujuka under moss on stones, 12,750 ft. Plesiotype in British Museum (Natural History) ; a further specimen in author's collection.

Aethiopella Handschin, 1942.

Aethiopella ugandensis sp. n. (figs. 39–49).

Colour : Deep bluish black with a fine mottling of paler spots. *Clothing :* Short, simple setae, sparse. *Body :* Length up to 4·2 mm., width up to 2 mm. Abd. V with posterior margin emarginate, concave ; abd. VI showing from above. Antennae slightly longer than head, 60 : 45 ; ant. III and IV distinct, the four segments related as 19–22 : 18–28 : 15–20 : 60 ; ant. IV with two apical sensory knobs and clothing of both long and short sensory setae ; ant. III on distal margin with sense organ of two very small, stout, bent, exposed sense rods, scarcely bigger than the cuticular tubercles (fig. 46). Ocelli 8 to each side arranged as in fig. 43. Postantennal organ oval, about twice as long as the diameter of the adjacent ocellus, arranged as a cluster of 45–53 tubercles. Mandible expanded apically with numerous teeth but no molar area (fig. 39) ; maxilla lamellate with recurved apex and sub-apical tooth (fig. 40). Rami of tenaculum each with three teeth. Cuticle very finely and evenly tuberculate and very finely granulate. *Legs :* Claw large and stout, distinctly granulate and rugose basally and laterally, with one internal tooth at one-quarter to one-third down, no outer teeth nor basal setae ; tibiotarsus on inner face with two very long, apically hooked tenent hairs reaching to and overhanging apex of claw, and, distal to these, two shorter similar hairs, reaching to level of claw tooth ; no external tenent hairs. Unguiculus vestigial, represented by a short blunt process. *Furcula :* Short ; manubrium stout ; dens with 5 simple setae on posterior face and one on the exterior lateral face. Mucro slightly longer than dens, tapering, with spoon-like apex and distinct deep groove along posterior face (fig. 42).

Holotype in the British Museum (Natural History) from Uganda : Ruwenzori, above Lake Bujuka, under moss and stones.

Paratypes in the British Museum (Natural History), Museum Comparative Zoology, Harvard U.S.A., from the same locality as holotype and from Ruwenzori, Mt. Baker, 15,250 ft., in soil sample.

A NEW SUBGENUS AND SPECIES OF *MYZUS* PASSERINI, 1860 (HEM., APHIDIDAE).

By H. L. G. Stroyan, M.A., F.R.E.S.

Sciamyzus, subgen. n.

Subgenus of *Myzus* Passerini, 1860. Characters for the most part as in main genus. *Apterous viviparous females* with frontal prominences convergent, the concavity between them deep; dorsal body cuticle strongly reticulate, the reticulations irregularly wrinkled and giving the appearance of a squamous imbrication, in the living aphid appearing shagreened under high magnifications; siphunculi slightly expanded at base and a little swollen towards apex, especially on inner side, strongly and coarsely imbricate, with a very small rudimentary flange and a small porus; cauda with a slightly constricted base. *Alate viviparous females* with sclerotic abdominal pattern composed of separate segmental spinal bars on all segments, those on abd. 1 and 2 being broken medially, and round marginal sclerites on abd. 2–4 inclusive; without ventral pleural sclerites on the abdomen; secondary rhinaria present along ant. III and IV, those on III irregularly disposed all along the joint, those on IV in a single row. Adults with 2 hairs on 8th abdominal tergite. First instar larva with 6 pronotal hairs (2 pairs marginal and one pair spinal) and pleural hairs from mesothorax to abd. 4 inclusive. Tibial apices in larvae not armed with spinules between the hairs. Spiracles open, not covered by an overhanging operculum. Chaetotaxy of first tarsal joints 3.3.2.

Type of subgenus *Myzus* (*Sciamyzus*) *cymbalariae*, sp. n.

Myzus (Sciamyzus) cymbalariae, sp. n.

Apterous viviparous female: Body small, oval, rather slender. Colour pale dull yellowish green to a greater or less extent mottled or suffused with brownish to dark crimson red, more particularly in specimens collected during the winter. Old individuals appear deep brown to blackish brown to the naked eye. *Antennae* rather strongly curved, slender, 6-jointed, usually a little shorter than the body, pale brownish sclerotic, slightly darker apically; joints III and IV strongly imbricate on inner (anterior) side, only weakly so posteriorly; joints V and VI more evenly and less strongly imbricate. Basal part of joint VI fairly long, approximately three-fifths as long as joint V. *Antennal hairs* short and inconspicuous; those on anterior side of joint III inverse-bottle-shaped, those on posterior side more or less acute, up to about 7 μ in length, or slightly over one-third articular diameter of joint. *Head* with strongly marked convergent lateral frontal prominences; these, together with antennal joints I and II, are armed with coarse granular spinules, which give way to rather closely set rows of finer spinules on the vertex and midventral regions of the head; the rows approximately follow the contours of the antennal bases, compound eyes and clypeus. The clypeus itself is sparsely spinulose. The cephalic hairs are normal in shape and arrangement, up to about twice as long as the distal hairs of ant. III, or about one-third the minimum width of the frontal emargination. Triommatidion of compound eyes large and conspicuous. *Rostrum* reaching about to third coxae; apical joint normal in shape, about equal to or slightly shorter than basal part of ant. VI, and with about 6 secondary hairs on its basal three-fifths, these being small and inconspicuous. *Body cuticle* membranous, slightly yellowish, adorned both dorsally and ventrally with an irregular reticulate wrinkling, which is much more transverse ventrally; the abdominal segmentation is obsolete dorsally from abd. 1 to 6, but represented ventrally

by a reduction in the cuticular sculpture along the intersegments. The cuticular sculpturing is much less conspicuous in material collected in midsummer than in winter specimens, and in these summer specimens small dusky pigmented marginal tubercles are variably present from abd. 2–5 inclusive. *Dorsal body hairs* very small and blunt, not more than about 5 μ long; *ventral hairs* longer and acute, up to 14 μ long. *Siphunculi* slender, expanded at base and slightly clavate from about ½; apex with a barely noticeable flange

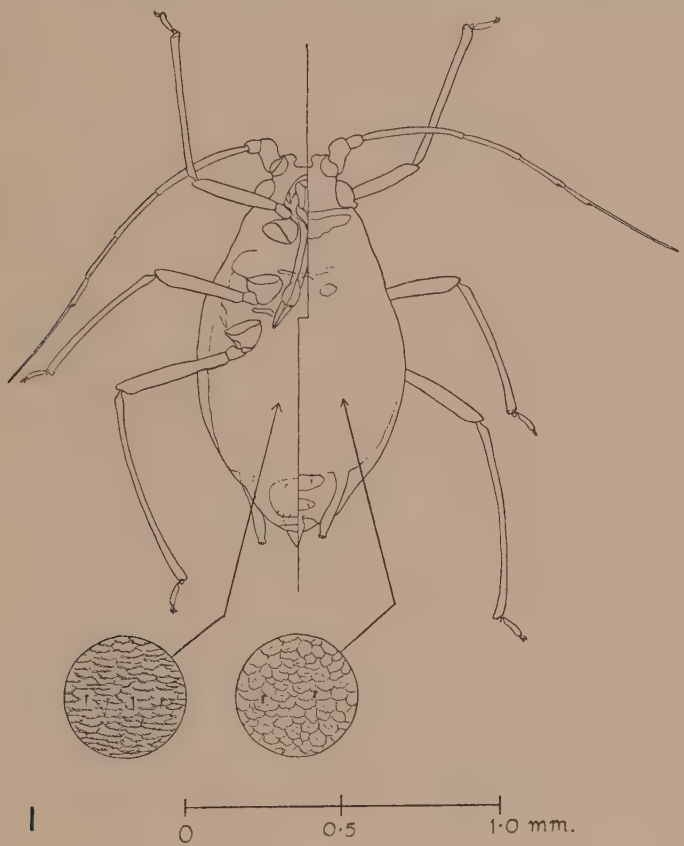


Fig. 1.—Apterous viviparous female *Myzus* (*Sciamyzus*) *cymbalariae* sp. n. (projector drawing from cleared specimen). Ventral detail to left, dorsal detail to right of midline. Hairs, except on tergites abd. 7–8 and subgenital plate, omitted. Insets: ventral and dorsal cuticular detail, much enlarged.

and a membranous distensible operculum; strongly imbricate over their whole length, which is equal to or slightly greater than that of ant. IV; pale brownish in colour, hardly darker than body cuticle. *Cauda* elongate triangular with a slight basal constriction, subequal to apical rostral joint; typically with 3 pairs of hairs, the apical pair smaller than the others. *Legs* rather long and slender, pale brownish with tibial apices darker; coxae, femora ventrally and extreme bases of tibiae imbricate; hind tibiae rather incurved; tibial hairs outwardly short, inwardly rather longer, lengthening towards apex, where the longest are about three-quarters the tibial diameter. *Subgenital plate* rather large, oval, with a single pair of hairs near the anterior border and about six inconspicuous hairs in

two groups of three laterally on the posterior margin. Rudimentary gonapophyses three, the median one smaller than the lateral ones and with hardly conspicuous gonochaetae.

Measurements of five specimens (Nos. 1–2 from *Cymbalaria*, Cambridge, 28.iv.53 and 9.xii.52; No. 3 from *Achillea serbica*, Cambridge, 30.iv.53; No. 4 from *Sagina procumbens*, Cambridge, 4.v.53; and No. 5 from *Cerastium tomentosum*, North Berwick, 15.vi.50).

Body.	Ant.	Joint ratios (III–VI).	Siph.	Cauda.	Ap. jt. rost.	2nd jt. h. tarsi.
1·22	1·09	20 : 12 : 10 : 6 + 20	0·22	0·09	0·10	0·08
1·46	1·25	23 : 14 : 12 : 7 + 22	0·24	0·10	0·10	0·08
1·66	0·98	18 : 12 : 10 : 6 + 15	0·26	0·10	0·10	0·08
1·41	1·06	19 : 13 : 10 : 6 + 18	0·22	0·10	0·10	0·08
1·61	1·27	23½ : 15 : 12½ : 7½ + 21	0·27	0·11	0·11	0·08

All length measurements are in millimetres, and the antennal length is given without joints I and II.

Alate viviparous female.—Head, thorax and *apices of femora* blackish sclerotic; abdomen dull yellowish green more or less suffused with red. *Antennae* long and slender, longer than the body; joints I and II spinulose as in apterae, joints III to VI slightly imbricate but not scabrous; joint III with 40–42 secondary rhinaria irregularly disposed over its whole length, joint IV with a single row of 6–9 secondary rhinaria over about three-quarters of its length; basal part of joint VI subequal to half the length of joint V. Whole *head* finely spinulose, lateral frontal prominences well marked and convergent; frontal and occipital hairs fine and acute, up to 18 μ long; 3 each side on the frontal prominences, 3 pairs in the frontal emargination, 2 median pairs on the vertex and a transverse row of 4 across the occiput. Very small spinal tubercles may be present occipitally just behind the median occipital hairs. *Pronotum* with a small and inconspicuous pair of marginal tubercles. Abdominal cuticle dorsally more or less featureless, ventrally with inconspicuous transverse rows of spinules. *Abdominal pigmentation* consisting of round marginal sclerites, which may bear small tubercles, on abd. 2–4 inclusive, separate transverse spinal bars across abd. 1–8 inclusive, those on 1–2 being divided medially, and small intersegmental muscle sclerites. In one specimen a small pair of spinal tubercles is present on the seventh tergite. *Rostrum* and *siphunculi* as in apterae; *cauda* slightly longer, a little more than or equal to half siphunculi. *Legs* without the femoral imbrication seen in apterae, and with tibiae darkened gradually over apical half. Median gonapophysis larger than in apterae, and with well-marked gonochaetae. Posterior border of subgenital plate with about eight hairs.

Measurements of one specimen (from *Cymbalaria*, Cambridge, 9.xii.52): Body 1·70 mm., antenna without joints I and II 1·82 mm., joint ratios (III–VI) 34 : 22 : 19 : 10 + 29, siphunculus 0·22 mm., cauda 0·12 mm., apical joint of rostrum 0·11 mm., 2nd joint of hind tarsus 0·09 mm., secondary rhinaria on ant. III 42 and 40, on ant. IV 7 and 9.

Larvae.—Colour pale yellowish green to pale greenish buff; *antennae* and *legs* slightly darker towards apices. *Antennae* in 1st instar 4-jointed, but with sometimes an incipient division of joint III. *Cauda* in 1st instar 2-haired.

Biology.

Myzus cymbalariae was first detected by Mr. D. Hille Ris Lambers while collecting in the company of the writer. The aphids were found living scattered

on the stems and under the leaves of a small isolated clump of *Cymbalaria cymbalaria* growing from the base of a brick wall in the courtyard of the Dept. of Zoology, Downing St., Cambridge. This was on 26th Nov., 1952. Subsequently further material was collected from the same host growing on old walls along the " Backs " by the River Cam (April, 1953). Recently the writer has discovered in his possession a series of slides of the species taken on *Cerastium tomentosum* at North Berwick, East Lothian, in June, 1950, and noted at the

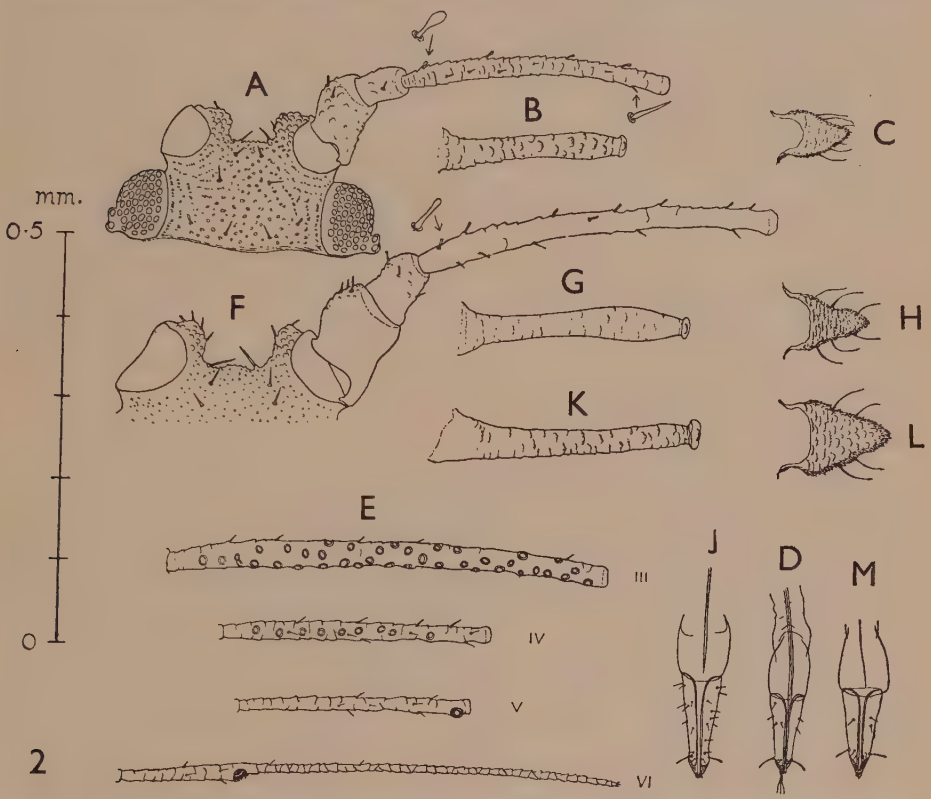


FIG. 2.—*Myzus* (*Sciamyzus*) *cymbalariae*, sp. n. A, apt. viv. female, head with ant. joints I–III. B, apt. viv. female, siphunculus. C, apt. viv. female, cauda. D, apt. viv. female, apical joint of rostrum. E, al. viv. female, antennal joints III–VI. *Myzus* (*Nectarosiphon*) *ascalonicus* Doncaster. F, apt. viv. female, head with ant. joints I–III. G, apt. viv. female, siphunculus. H, apt. viv. female, cauda. J, apt. viv. female, apical joint of rostrum. *Myzus* (*Tubaphis*) *ranunculinus* (Walker). K, apt. ovip. female, siphunculus. L, apt. ovip. female, cauda. M, apt. ovip. female, apical joint of rostrum. *N.B.*—In fig. 2, J, D and M the dorsal and ventral hairs of the apical rostral joint are represented in focus together.

time of collection as a small form of *Myzus ascalonicus* Doncaster. This caused a further search to be made for the species on various wintergreen perennials of tufted habit in the vicinity of Downing St., and resulted in the discovery of the aphids living on *Achillea serbica* Petrovic growing on a small rockery by the Dept. of Physiology, and on minute tufts of *Sagina procumbens*

growing near the original plant of *Cymbalaria* on which the species was first detected. Subsequently apterae were thrashed (on 21.v.53) from *Cerastium tomentosum* in the Botanic Garden, Cambridge, mixed with large numbers of alate and apterous *Myzus ascalonicus* Doncaster. Transfers from *Cymbalaria* to *Achillea*, *Achillea* to *Cymbalaria* and *Cymbalaria* to *Sagina*, performed in petri dishes, were all immediately successful. Mr. Hille Ris Lambers, to whom these findings were communicated, replied (*in litt.*) that he had also found the species to do moderately well on young grass and young nettles. It would appear that *Myzus cymbalariae*, like *M. ascalonicus* Doncaster, 1945, and *M. ornatus* Laing, 1932, is a rather polyphagous species passing the winter anholocyclically on a variety of tufted perennials under which it can obtain shelter. Alatae up to now remain extremely rare ; two specimens were taken from the original colony on *Cymbalaria*, and a single imperfect alata (or rather, an extreme alatiform aptera, with well developed wings but a largely apteriform head and antennae) was found among the *Cerastium* material from North Berwick.

The small size, dirty brownish or reddish colour and concealed mode of life of this species make it as a rule hard to detect ; but it may on occasions, as on *Cerastium* at North Berwick in 1950, become so numerous as to smother the host. It is possible that further material may exist in collections confused with *M. ascalonicus*.

Taxonomic Position.

The very complete series of rather evenly sized transverse sclerites on the abdominal dorsum of alate *Myzus cymbalariae* is the most important character separating the subgenus *Sciamyzus* from other recognised subgenera of *Myzus* Pass., all of which show the concentration of sclerotic components on abd. 3–6 inclusive into a more or less solid pigmented patch. Other genera in which such a mid-dorsal patch occurs (e.g., *Sappaphis* Matsumura) also include species with the patch broken up along the inter-segments ; but in no case yet seen is this accompanied by a simultaneous increase in size of the sclerites of abd. 1 and 2, in such a way as to give a complete and even series on all the abdominal segments.

Hille Ris Lambers (1947) erected the genus *Tubaphis* for *Aphis ranunculina* Walker, 1852. In this species the alatae show a very similar abdominal pattern to that of *Sciamyzus*, and the distribution of secondary rhinaria on the antennae and the presence of a rather strong basal constriction in the cauda of the apterae are other characters resembling the species under consideration. *Tubaphis* differs, however, in the non-convergent, parallel-sided frontal prominences of the apterae, the marked siphuncular flanges and the presence of typical *Myzus* spinules between the apical hairs of the hind tibiae in immature forms. The dorsal cuticle of the apterae also is without any very marked sculpturing, and the eighth abdominal tergite bears typically 4 hairs.

Börner (1952) divides the species hitherto placed in *Myzus sensu latiori* between two separate tribes, the Phorodontini and the Myzini, the latter with and the former without tibial spinules in the young forms. He further removes *M. ascalonicus* Doncaster from the genus *Myzodes* and places it with the genus *Rhopalomyzus* Mordvilko. For the purpose of the present account the writer prefers to retain *Nectarosiphon* Schout. (*Myzodes* Mordvilko) as a subgenus of

Myzus Passerini in spite of the unarmed larval tibiae. If this standpoint should ultimately be rejected, the subgenus *Sciamyzus* will become part of *Nectarosiphon* Schout. rather than *Myzus* Pass. At the same time, *Tubaphis* H. R. L. is here regarded also as a subgenus of *Myzus* s.l., since the characters separating it from *Myzus* proper are all considered as of not more than subgeneric value. *Jacksonia* Theobald, another related genus, is, however, considered to be a valid full genus, the morphology of the alatae being very distinct (Stroyan, 1950).

The following short key will serve to separate the present subgenera of *Myzus* Passerini:

1 (6) Alatae with a more or less solid pigmented area on dorsum from abd. 3–6 inclusive, formed by the fusion of segmental sclerites on these tergites.

2 (5) Alatae without lateroventral pigmented sclerites on any abdominal sternites. Immature forms with spinules present between apical hairs of hind tibiae.

3 (4) Apterae with dorsal cuticle rugosely sclerotic. Alatae with secondary rhinaria on ant. III only **Myzus** Passerini, s.s. (type *cerasi* (F., 1775)).

4 (3) Apterae with dorsal cuticle membranous. Alatae with secondary rhinaria on ant. III–V inclusive
Prunomyzus Lambers & Rogerson, 1945. (type *Prunomyzus padellus* L. & R.).

5 (2) Alatae with pigmented sclerites present, though often inconspicuous, on the lateral parts of the abdominal sternites in the region of the siphunculi. Tibial spinules absent in immature forms
Nectarosiphon Schouteden, 1901 (type *convolvuli* (Kalt., 1843) = *persicae* (Sulzer, 1776)).*

6 (1) Alatae with separate segmental bars on abdominal tergites, not forming a more or less solid patch from 3–6 inclusive.

7 (8) Tibiae in immature forms with apical spinules as in couplet 2 (5). Siphunculi markedly flanged, almost cylindrical over distal half
Tubaphis Hille Ris Lambers, 1947 (type *ranunculina* (Walker)).

8 (7) Tibiae in immature forms without spinules. Siphunculi barely flanged at apex, slightly but distinctly swollen over their distal half
Sciamyzus subg. n. (type *Sciamyzus cymbalariae* sp. n.).

The apterae of *Myzus cymbalariae*, particularly the less heavily pigmented and sculptured midsummer forms, may easily be confused with small apterae of *Myzus ascalonicus* Doncaster, which has very similar habits and infests the common garden *Cerastium tomentosum*, on which *M. cymbalariae* has also occurred. The most reliable differences are the frontal prominences, which are convergent in *cymbalariae* and hardly so, or parallel-sided, in *ascalonicus;* and the number of secondary hairs on the apical rostral joint (5–6 in *cymbalariae*, 8–15 in *ascalonicus*). The more heavily pigmented and sculptured winter apterae of *cymbalariae* are too distinct to be confused.

From the description of *Ovatus titschacki* Börner (Börner, 1942), now placed by the author (Börner, 1952) in *Myzodes* Mordvilko, this species must be closely related to *Myzus cymbalariae*. It was taken from " Seggen " (? *Carex* sp.) and tussocks of *Juncus*, and should be distinguishable from *M. cymbalariae* by the

* Hille Ris Lambers (1952).

less extensive spinulosity of the vertex and the longer processus terminalis (about four times basal part of VI in *titschacki*, $2\frac{1}{2}$ to $3\frac{1}{2}$ times basal part in *cymbalariae*). It is by no means certain, however, that these differences are sufficient for separation, and pending an opportunity for comparison of the two forms the possibility cannot be excluded that *Myzus cymbalariae* is a synonym of *M. titschacki*.

Type Material.

The type series of this species (holotype aptera and morphotype alata, with paratype alata and apterae) from *Cymbalaria cymbalaria*, Cambridge, November–December, 1952, is in the writers' collection. The holotype and morphotype will ultimately be deposited in the British Museum (Natural History). Material derived from the same collection is in the possession of Mr. D. Hille Ris Lambers of Bennekom, Holland.

Acknowledgment.

The best thanks of the writer are due to Mr. D. Hille Ris Lambers, who although responsible for the detection of this species has declined to publish a description, and has supplied much constructive comment during the preparation of the present paper.

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CHIRONOMIDAE (DIPTERA) FROM WESTERN CAPE PROVINCE—III.

By Paul Freeman, M.Sc., F.R.E.S.

(*British Museum, Natural History.*)

The two previous papers in this series are to be found on pages 127–135 and 201–213 of Vol. 22 of these *Proceedings*. Reference should be made to Part I for details of localities, collectors and terms used. It was originally intended that this should be the last of the series, but it now seems possible that a fourth and final part will be necessary to deal with material collected by Dr. K. M. F. Scott since the series was started.

Chironomus (*Chironomus*) *caffrarius* Kieffer.

Chironomus caffrarius Kieffer, 1914, *Ann. S. Afr. Mus.* **10** : 265.

8 ♂, 2 ♀, Rondebosch, 28.viii.52 ; 2 ♂, Rondebosch, 26.xi.52 ; 1 ♂, 1 ♀, Bergvliet, 10–25.ix.52 ; 1 ♂, 4 ♀, Bergvliet, 15–22.x.52.

Chironomus (*Chironomus*) *sensualis* Kieffer.

Chironomus sensualis Kieffer, 1914, *Ann. S. Afr. Mus.* **10** : 267.

1 ♀, Bergvliet, 23.x.52 ; 3 ♂, 1 ♀, Kirstenbosch, 25.xi.52.

There are further specimens in the British Museum from Natal : Weenen, and Belgian Congo : Elisabethville.

Chironomus (Chironomus) nivalis sp. n.

Distinguished from the other African species so far described by the pruinose bands on the thorax. In general a pale yellowish green species with ferruginous mesonotal bands and black markings on the abdominal segments ; knees darkened ; terminalia very similar to many other species.

Male.—Wing length 3·5–4·0 mm.

Head yellowish, face darker, mouthparts brown ; frontal tubercles distinct ; pedicel brown, flagellum rather paler, A.R. about 3. *Thorax* yellowish green and pruinose, scutal stripes, postnotum, sternopleuron reddish brown ; when seen from the front the pruinosity shows a characteristic pattern of lines : two anterior diagonal lines on the shoulders, the lines of the acrostichal and dorso-central bristles, a line dividing each lateral brown stripe longitudinally and a spot each side at the middle of the central stripe ; when seen from the back, the pruinose areas become matt and the matt areas become pruinose. *Legs* yellowish green, apices of tibiae and tarsal segments brown, a brown band is distinguishable above and below the knees, sometimes basal third of anterior tibia dark. L.R. of front leg 1·5–1·75, second segment about half as long as basitarsus, segments 3 and 4 progressively shorter, segment 5 rather less than half as long as 4 ; pulvilli broad ; no tarsal beard. *Wings* normal, cross-vein darkened, halteres greenish. *Abdomen* greenish, segments 1–4 with dark markings ; on 1 more or less transverse or even absent, on 2–4 in the form of a median dark band occupying the basal three-quarters with lateral expansions to the margin in the basal half of the segment, segments 5–8 more or less totally dark. *Hypopygium*

(fig. 9*a*) very similar to many other species, anal point seems always to be longer than appendage 2, and appendage 1 to be slightly swollen and to reach more than half-way along appendage 2, apical half of style strongly narrowed.

Female.—Wing length 4·0 mm.

Similar to male except that abdomen almost wholly dark with apical margins of segments pale. Antennae six-segmented, brown, segment 6 black and twice as long as 5, sensory hairs normal, short, necks of segments 3–5 as long as basal bulbous portions.

Holotype male, Bergvliet, 22.x.52. Paratypes: 1 ♂, 5 ♀, Bergvliet, 16–23.x.52; 1 ♂, Cape Province: Ceres, xi.'20 (*R. E. Turner*); 6 ♂, Natal: Weenen, iii–iv.25 (*H. P. Thomasset*); 4 ♂, S.W. Africa: Ovamboland, 8.ix.34 (*B. de Meillon*); 4 ♂, Belgian Congo: Elisabethville, x.33 (*C. Seydel*); 1 ♂, Nyasaland: Mt. Mlanje, 9.xii.12 (*S. A. Neave*).

Chironomus (**Chironomus**) **brunneus** sp. n.

Very similar to *C. nivalis* in size and structure, but thorax without well marked pruinose bands, whole insect much darker; legs without defined black apices to the segments, frontal tubercles small, appendage 2 of hypopygium longer.

Male.—Wing length 4 mm.

Head yellow, mouthparts dark brown, pedicel dark brown, flagellum pale brown, A.R. nearly 4; frontal tubercles present, rather small. *Thorax* yellow, mesonotal stripes, apical half of postnotum, a spot below the wing, and sternopleuron very dark brown; thorax matt with slight pruinosity especially on shoulders, but with no defined pruinose lines or spots. *Legs* brown, tarsi rather darker, no defined black apices to the segments, L.R. 1·5, proportions of other segments as in *nivalis*; anterior tarsal beard distinct but not well formed. *Wings* normal, cross-vein darkened, halteres pale. *Abdomen* dark, segments 1–5 with pale apical bands occupying a quarter to a third of the segment. *Hypopygium* (fig. 9*b*) very similar to *nivalis* but style not so sharply contracted, appendage 1 not swollen nor reaching so far along appendage 2, the latter slightly but distinctly longer than anal point.

Female.—Two females from the same locality as the holotype but with a different date seem to belong to this species though they are rather larger (wing length 5 mm.).

Very similar to male, thorax rather more brown, anterior legs slightly darker, abdomen dark brown, pruinose, apical margins of segments pale. Antennae six segmented, last segment with normal sensory bristles and equal in length to 4 and 5 together.

Holotype male, Kirstenbosch, 29.iv.52. Paratypes, 2 ♀, Kirstenbosch, 25–26.xi.52.

Chironomus (*Calochironomus*) *palustris* Kieffer.

Chironomus palustris Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or.* Ins. Dipt. I: 16.
Chironomus iricolor Kieffer, 1914, *Ann. S. Afr. Mus.* **10**: 264; **syn. nov.**
Calochironomus oxylabis Kieffer, 1922, *Ann. Soc. ent. Fr.* **91**: 67; Goetghebuer, 1936, *Rev. Zool. Bot. afr.* **28**: 467; **syn. nov.**

1 ♀, Berg R., Wellington, 12.vi.52; 5 ♂, 2 ♀, Bergvliet, 23–28.x.52; 2 ♂, Zeekoe Vlei, 3.xi.52.

Examination of the type series of *C. palustris* in the Muséum National d'Histoire Naturelle, Paris, has shown that Dr. Scott's specimens belong to this species. They are also indistinguishable from the descriptions of *C. iricolor* and *Calochironomus oxylabis*, both of which names must fall as synonyms. I am leaving the species in the subgenus *Calochironomus* for the present until it is possible to be more certain of the identity of the type, *C. fusconotatum*

Kieffer, of the subgenus. It seems likely that it may have to be moved eventually to the subgenus *Einfeldia*.

It is a widespread species in Africa, readily recognised by the faintly clouded and iridescent wings, and by the shape of appendage 1 of the male hypopygium. There are specimens in the British Museum from : Cape Province, S.W. Africa, Natal, Transvaal, Kenya, Nyasaland, Belgian Congo (Kivu), Cameroons, Nigeria, French Sudan (Ifan).

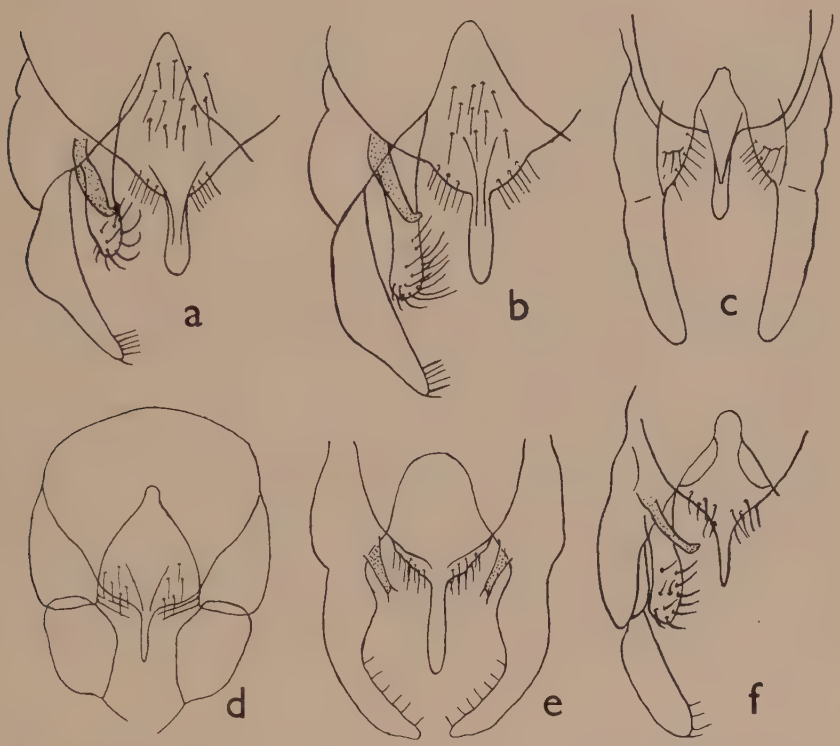

Fig. 9.—Hypopygia, not all to the same scale. (a) *Chironomus* (*Chironomus*) *nivalis* ; (b) *C.* (*C.*) *brunneus* ; (c) *Chironomus* (*Cryptochironomus*) *monilis* ; (d) *C.* (*Cr.*) *subovatus* ; (e) *C.* (*Cr.*) *forcipatus* ; (f) *Stictochironomus albipes*.

Chironomus (*Dicrotendipes*) *pilosimanus* Kieffer.

Dicrotendipes pilosimanus Kieffer, 1914, *Ann. S. Afr. Mus.* **10** : 262.

2 ♂, 3 ♀, Berg R., Wellington, 20.v–6.vi.52 ; 3 ♂, 4 ♀, Rondebosch, 28.viii.52 and 2 ♀, 26.xi–2.xii.52 ; 15 ♂, 8 ♀, Bergvliet, 10.ix–23.x.52 ; 2 ♂, Berg R., Piquetberg, 25.ix.52 ; 5 ♂, 5 ♀, Zeekoe Vlei, 3–26.xi.52.

Chironomus (Cryptochironomus) monilis sp. n.

A small green species with reddish brown scutal stripes belonging to Series 4 of Edwards's classification and to *Harnischia* in Goetghebuer's classification ; frontal tubercles absent, hypopygial appendages absent, no tarsal beard, female antennae short.

Male.—Wing length 1·4–5 mm.

Head green, clypeus blackish, mouthparts brown, antennae pale brown, A.R. about 1·8, frontal tubercles absent. *Thorax* green; scutal stripes, postnotum, a spot below the wing, and sternopleuron reddish brown. *Legs*: femora green, apical hook-like structure present but not very obvious, all tibiae brown, tarsi rather darker, anterior tibiae and tarsi especially dark, no tarsal beard, L.R. 2; last tarsal segment dorso-ventrally flattened, large pulvilli present; each tibial comb of posterior leg with a spur. *Wings* normal; costa ending beyond level of M_{3+4}, R_{2+3} ending nearer R_1, squama fringed, halteres green. *Abdomen* green; hypopygium (fig. 9*c*) brownish, styles simple, appendages 1 and 2 absent, possibly represented by a slight fold on the coxite bearing two or three bristles, style hardly separated from coxite.

Female.—Wing length 1·3–1·7 mm.

Similar to male. Antennae short, segments 3–5 moniliform, without necks, segment 6 dark and as long as 3–5 together.

Holotype male and paratypes 6 ♂, 9 ♀, Berg R., Piquetberg, 26.xi.52; 2 ♀, same locality, 30.x.52.

Chironomus (**Cryptochironomus**) **subovatus** sp. n.

This belongs to the same group as the previous species. Body practically all black in the holotype, stripes partially separated in the paratypes, legs pale, antennal plumes white, styles of hypopygium nearly oval.

Male.—Wing length 2 mm.

Head and mouthparts brown, frontal tubercles absent, antennae brown, pedicel darker and pruinose, plumes white, A.R. about 2·75. *Thorax* of holotype except for scutellum completely black with grey pruinosity, paratypes have pale shoulders and the stripes partially separated, scutellum brown; acrostichal bristles small, dorso-centrals longer, uniserial, whitish. *Legs* very pale, tarsi brown except for basal half of basitarsus which is pale, L.R. 1·75, no tarsal beard, pulvilli present, last tarsal segment flattened. *Wings* milky; costa ending beyond level of tip of M_{3+4}, R_{2+3} nearer to R_1; halteres pale. *Abdomen* blackish, membranous apical margins of tergites pale, hairs whitish. Hypopygium (fig. 9*d*): anal point well developed, styles almost oval, appendages 1 and 2 both absent, possibly represented by two long bristles.

Female not known.

Holotype male, Berg R., Piquetberg, 26.xi.52. Paratypes, 2 ♂, Cape Province: Ceres, iii.1925 (*R. E. Turner*).

Chironomus (**Cryptochironomus**) **forcipatus** sp. n.

Belongs to the species group *Parachironomus*; thorax green with black stripes, abdomen and anterior legs black; hypopygium rather similar to that of *C. aegyptius* Kieffer but appendage 1 shorter.

Male.—Wing length 2·3 mm.

Head brown, frontal tubercles absent, mouthparts black, pedicel black, flagellum brown, A.R. 2. *Thorax* green, slightly shining, scutal stripes separate and black, postnotum and sternopleuron black; dorso-central bristles small and uniserial. *Legs*: anterior legs entirely black except for ventral surfaces of femora which are green, L.R. 1·5, pulvilli well developed, last tarsal segment dorso-ventrally flattened, no tarsal beard; mid and posterior legs brownish green, tarsi darkened except on basal half of basitarsus. *Wings* milky, costa ending at level of tip of M_{3+4}, R_{2+3} ending nearer to R_1; anal area well developed, squama fringed. Halteres green. *Abdomen* black with slight green tinge. *Hypo-*

pygium (fig. 9*e*) with well developed anal point and forficulate styles, appendage 1 rod-like with two hairs at apex, appendage 2 absent.

Female.—Not known.

Holotype male, Berg R., Piquetberg, 25.ix.52.

Stictochironomus albipes sp. n.

General colour brown with pruinose and brown mottling on thorax, legs mainly whitish without rings, wings unmarked, posterior fork below cross-vein.

Male.—Wing length 3 mm.

Head brown, mouthparts black, palpi brown, second and third segments equal, fourth one and a half times as long; pedicel brown, flagellum whitish, A.R. 2; frontal tubercles absent. *Thorax* dark brown, rather mottled, shoulders paler and pruinose; lines of acrostichal bristles and lateral margins pruinose, also some of the mottling is due to pruinosity; central tubercle or prominence, characteristic of the genus, present as usual; bristles whitish. *Legs:* all femora brown, pale at the tips; all tibiae white, combs of posterior four fused and with a single spur; all tarsi white with segments 4 and 5 brownish; L.R. 1·2, pulvilli small, anterior tarsi without well-developed beard, other legs with long white hairs on tibiae and tarsi. *Wings* milky and with brownish tinge anteriorly; R_{2+3} meeting costa about one-third of distance between R_1 and R_{4+5}; posterior fork below cross-vein. *Halteres* yellow. *Abdomen* brown with whitish hairs and with some pruinosity at the incisures. *Hypopygium* (fig. 9*f*) without any striking features; anal point narrow and well developed, appendage 1 narrow and strongly curved down at the apex, appendage 2 as long as the coxite, style simple, not contracted apically.

Female.—Wing length 3–4 mm.

Shows a general resemblance to the male, abdomen may be rather more mottled with pruinosity; antennae six segmented, segments 3–5 with well-formed necks half as long as the rest of the segment, segment 6 nearly as long as 4 and 5 together.

Holotype male, Abyssinia: Waldia, 1–26.ii.36 (*J. W. S. Macfie*); 1 ♂, 1 ♀, S. Rhodesia: Melsetter, ii.29; 3 ♂, 4 ♀, Natal: Weenen, xii.23 (*H. P. Thomasset*); 1 ♀, Cape Province: Berg R., Piquetberg, 9.ix.52 (*K. M. F. Scott*).

Polypedilum scotti sp. n.

A brown species with clear, unmarked wings. Easily distinguished from other species so far described from this Region by its colour and hypopygial structure.

Male.—Wing length 2–2·3 mm.

Head, mouthparts, antennae brown, pedicel reddish brown, A.R. about 2. *Thorax:* mesonotal stripes pale brown and fused, shoulders pleura and scutellum more yellowish, postnotum and sternopleuron brown. Dorso-central and acrostichal bristles long and irregularly biserial, scutellum with uniserial fringe of long bristles. *Legs* uniformly brown, L.R. nearly 2, four posterior legs well covered with hair giving a shaggy appearance, anterior tarsi without beard, only one comb of posterior tibiae armed. *Wings* uniformly clear with no markings; R_{2+3} running close to R_1; costa reaching nearly to wing tip, well beyond level of M_{3+4}, not produced; posterior fork beyond cross-vein; squama fringed. *Halteres* pale. *Abdomen* uniformly brown and hairy, some specimens have apical margin of segments appearing rather paler, probably due to their being membranous. *Hypopygium* (fig. 10*a*) with narrow anal point, appendage 1 narrow (rather wider if specimen is viewed from the side) with a long hair near the base, appendage 2 fairly straight with a long apical bristle, style contracted at apex, inner row of bristles rather long.

Female.—Wing length 2·5–8 mm.

Similar to male but rather darker; segments 3 and 4 of antennae with well-developed

necks, 5 with no neck, 6 equal to 4 and 5 together, 2–5 with whorls of long bristles, 6 with three or four long bristles at the tip.

Holotype male and paratypes 7 ♂, 5 ♀, Berg R., Wellington, v–vi.52; 1 ♂, French Hoek Forest Reserve, Berg R., 2.xii.52.

Polypedilum annulatum sp. n.

Very similar to the previous species but readily separated in the male by the pale abdominal rings and by the hypopygium.

Male.—Wing length 2–2·4 mm.

Head as in *P. scotti*, A.R. rather less, 1·75. *Thorax, legs, wings, halteres* also similar. *Abdomen:* apical third of each of segments 1–6 pale, so that abdomen appears ringed. *Hypopygium* (fig. 10*b*): appendage 1 broad basally, sharply contracted in apical half, appendage 2 shorter than in *scotti*, as long as anal point; style evenly rounded at apex, inner hairs shorter.

Female not known.

Holotype male and 1 male paratype, Kirstenbosch, 25.xi.52.

Polypedilum lobiferum sp. n.

Body dark with some pruinosity, legs brown, A.R. about 3; distinguished from other species of the genus by presence of frontal tubercles, plain wings, and bearded anterior tarsi in male.

Male.—Wing length 3·5 mm.

Head, mouthparts and antennae dark, pedicel black, A.R. about 3, well developed frontal tubercles present. *Thorax* completely black and dull, covered with grey pruinosity; acrostichal bristles small, poorly developed, dorso-centrals longer and irregularly biserial; all bristles pale. *Legs* brown, knees slightly darker, L.R. 1·1, pulvilli well developed, combs of posterior tibiae separate, only the smaller with a spur, anterior tibial scale white with short sharp black spur; legs fairly hairy, anterior tarsi with long beard. *Wings* milky with no dark markings, R_{2+3} meeting costa at about one-third distance between R_1 and R_{4+5}, posterior fork slightly distal to cross-vein. *Halteres* brown. *Abdomen* blackish brown, more shining than thorax. *Hypopygium* (fig. 10*c*): anal point stout and hairy, appendage 1 narrow, down-curved at apex, appendage 2 without long apical hair, styles blunt ended.

Female.—Wing length 3·3 mm. (1 specimen).

Very similar to male in colour; antennae brown, six-segmented, last segment equal to 4 and 5 together, segments 3–5 with poorly developed necks; frontal tubercles similar to male; anterior tarsi without beard; wings slightly brownish anteriorly; membranous apical margins of abdominal tergites pale.

Holotype male, Bergvliet, 19.v.52. Paratypes, 1 ♀, Bergvliet, 28.x.52; 1 ♂, Cape Province: Mossel Bay, x.1921 (*R. E. Turner*).

Pentapedilum anale sp. n.

Blackish; wings densely clothed with black macrotrichia; A.R. 1·3; abdomen shining, hypopygium with broad anal point and reduced appendage 1. Separable from the only other described Ethiopian species, *P. kribiense* Kieffer, by the dark colour.

Male.—Wing length 2·0 mm.

Head, mouthparts, antennae and plumes black, A.R. about 1·3. *Thorax* black, hardly paler on shoulders and scutellum, stripes shining with areas between slightly pruinose; acrostichal hairs long and irregularly biserial, dorso-centrals uniserial, scutellum with a

fringe of about 12 long hairs. *Legs* brown, well clothed with black hairs, L.R. about 1·5–1·75, no tarsal beard, pulvilli moderate, a single spur on the tibial combs. *Wings* unmarked, clothed densely over most of the surface with black macrotrichia ; R_{2+3} ending nearer R_1, costa ending beyond level of M_{3+4}, posterior fork beyond cross-vein, squama fringed. *Halteres* with black knobs and pale bases to the stems. *Abdomen* very dark,

Fig. 10.—Hypopygia, not all to same scale. (a) *Polypedilum scotti ;* (b) *P. annulatum ;* (c) *P. lobiferum ;* (d) *Pentapedilum anale ;* (e) *Tanytarsus* (*Tanytarsus*) *pallidulus ;* (f) *Tanytarsus* (*Cladotanytarsus*) *capensis ;* (g) *Tanytarsus* (*Rheotanytarsus*) *fuscus.* In (f) and (g) appendage 2*a* is drawn separately to the same scale as the main figure.

shining, with a greenish tinge. *Hypopygium* (fig. 10*d*) with very broad anal point, appendage 1 reduced, appendage 2 normal with a long hair at the tip, style not constricted.

Female.—Wing length 2–2·2 mm.

Quite similar to male, wing hairs denser ; sixth antennal segment equal to 4 and 5 together, 5 without neck, 3–4 with well developed necks.

Holotype male, Palmiet R., Elgin, 20.xi.52. Paratypes : 7 ♂, 5 ♀, Palmiet R., Elgin, 26.x–25.xi.52 ; 1 ♂, Muizenberg Mt., 22.v.52 ; 4 ♀, Berg R.,

Wellington, v.52 ; 3 ♀, Bergvliet, 19–28.x.52 ; 1 ♀, French Hoek, 22.x.52 ; 1 ♂, Kirstenbosch, 25.xi.52.

Tanytarsus (Tanytarsus) pallidulus sp. n.

Pale green with yellowish scutal stripes, frontal tubercles present, both tibial combs spurred, no pulvilli, macrotrichia present over most of the wing surface, appendage 2*a* of hypopygium short and with simple hairs.

Male.—Wing length 2·3 mm.

Head and mouthparts yellowish green, antennae brown, pedicel reddish yellow, A.R. about 1·4, frontal tubercles present. *Thorax* pale yellowish green, scutal stripes, postnotum, sternopleuron, yellow. *Legs* pale, anterior tarsi broken, tibial combs of posterior legs separated, each with a spur, pulvilli absent. *Wings* with macrotrichia over most of the surface, plenty in cell M_4, bare tracts along some of the veins in the basal half of the wing ; costa reaching beyond level of M_{3+4}, R_{2+3} ending nearer R_1. *Halteres* greenish. *Abdomen* green. *Hypopygium* (fig. 10*e*) with well-defined anal point, without a row of dots ; styles pointed and slightly curved ; appendage 1 fairly broad, 1*a* seems to be absent, 2 fairly normal, 2*a* short, clothed with simple hairs.

Female not known.

Holotype male, Kirstenbosch, ix.52.

Tanytarsus (Cladotanytarsus) capensis sp. n.

The hypopygium is similar to other species of this subgenus, such as the Palaearctic species *T. mancus* Walker and the Ethiopian *T. lewisi* Freeman, but there are certain differences in the lengths and shapes of appendages 1 and 1*a*. It is best distinguished from the other Ethiopian species by its larger size, mainly black thorax and abdomen, and presence of tarsal beard.

Male.—Wing length 1·75–2·3 mm.

Head brown, mouthparts darker, pedicel black, flagellum brown, plumes black, A.R. 1·2, frontal tubercles absent. *Thorax :* scutal stripes black, practically fused, shoulders, lateral margins and extremely narrow line of dorso-central bristles brownish yellow ; postnotum and sternopleuron black, most of pleura brownish. *Legs* pale brown with brown hairs, anterior legs dark ; L.R. about 1·75, anterior tarsi with well-developed beard ; pulvilli absent ; combs of posterior tibiae separated, each with a spur. *Wings* with a few macrotrichia at the apex, cell R_5 with a small patch at the tip and a single row reaching back for half the length of the cell, cell M_1 with about 5–6 at the extreme margin ; anal area developed but obtuse, squama bare. *Halteres* pale with brown stems. *Abdomen* blackish, with a green or brown tinge on the middle segments. *Hypopygium* (fig. 10*f*) of the normal form for the subgenus ; anal point short, styles short, appendage 1 distinctly constricted near the middle, 1*a* long and nearly straight, 2*a* with long branched hairs.

Female.—Wing length 1·75–2·3 mm.

Thorax greener than in male with separated brown or black stripes ; anterior tarsi without beard ; macrotrichia more numerous in cells R_5 and M_1, also some in cell M_4 ; antennae 5–6 segmented, segments 5 and 6 not always separate.

Holotype male, Zeekoe Vlei, 3.xi.52. Paratypes : 3 ♂, 4 ♀, Bergvliet, 19.v.52 and 25 ♂, 13 ♀, 15–28.x.52 ; 3 ♂, 2 ♀, Berg R., Piquetberg, 25.ix–30.x.52 ; 11 ♂, 12 ♀, Zeekoe Vlei, 3.xi.52.

In addition there are a male and two females from Berg R., Wellington, with similar hypopygium but with general body colour dark green and separate scutal stripes in the male, which also has a few macrotrichia in cell M_4. A

single male from Wemmer's Hoek is again structurally the same but the general body colour is grass green, the scutal stripes reddish brown and more or less fused. I am leaving these two forms as ? var. for the present.

Tanytarsus (Rheotanytarsus) fuscus sp. n.

Easily distinguished from *T.* (*R.*) *guineensis* Kieffer by its brown coloration; A.R about 0·6; L.R. 2; wings densely clothed with macrotrichia; general coloration brown.

Male.—Wing length 1·6–2·0 mm.

Head, mouthparts, antennae and plumes brown; A.R. only about 0·6, frontal tubercles absent. *Thorax* brown, mesonotal stripes slightly darker. *Legs* brown with brown hairs, L.R. 2, no tarsal beard, pulvilli absent, combs of posterior tibiae separate and each with a short spur. *Wings* thickly clothed with macrotrichia over most of the surface; anal area reduced, squama bare; costa ending just beyond level of M_{3+4}, R_{2+3} seems to be absent and R_1 and R_{4+5} very close as in the Palaearctic *T. photophilus* Goetghebuer. *Halteres* pale. *Abdomen* brown with brown hair. *Hypopygium* (fig. 10*g*): anal point well developed; appendage 1 shaped as shown, 1*a* apparently absent, 2 slightly clubbed, 2*a* hairy and with lamellae at the apex; style contracted at the apex but not as strongly as in other species.

Female.—Wing length 1·5–2·0 mm.

Similar to the male; two or three specimens apparently belonging to this species have the abdomen distinctly green. Antennae six-segmented. Segments 3–5 oval and without well-formed necks, segment 6 only slightly longer than 5.

Holotype male, Berg R., Wellington, 20.v.52. Paratypes: 1 ♂, Kirstenbosch, 29.iv.52 and 3 ♂, 25.xi.52; 1 ♂, Berg R., Wellington, 2.v.52; 1 ♂, Wemmer's Hoek, 12.v.52; 1 ♂, 1 ♀, Wemmer R., 9.vi.52; 2 ♀, Berg R., French Hoek, 22.x.52; 1 ♀, Berg R., Piquetberg, x.52; 1 ♀, Palmiet R., Elgin, 4.xi.52.

TWO NEW GENERA OF BOMBYLIIDAE (DIPTERA) FROM THE BELGIAN CONGO.

By S. J. Paramonov.

(C.S.I.R., Canberra, Australia,)

Among new material in the British Museum the author has found two new genera of Bombyliidae: one in the subfamily Exoprosopinae (*Ogilviella*), another in the subfamily Usiinae (*Pusilla*). Their descriptions are as follows:

Ogilviella gen. n.

Closely related to *Exoprosopa* and *Litorrhynchus*, but differing from all other genera in the origin of the second longitudinal vein, the base of which is situated a considerable distance before the cross-vein *r-m*, the distance between these two points being at least twice as great as the length of the cross-vein.

Head *Exoprosopa*-like, but proboscis very long, protruding beyond apex of face for a distance at least equal to length of head. Third segment of antennae basally unusually small, with an extremely long and thin style, which is at least twice the length of third segment. Shape of third segment very similar to that of *Anthrax* species, onion-like, as long as the small first segment.

Face strongly protruding. Palpi very short. Cheeks (sides of mouth cavity) extremely narrow. Indentation of hind margin of eyes very deep, the line of bisection of the eyes well developed. Occiput situated much lower than upper margin of eyes; behind vertex a very deep transverse furrow, of which there are only traces in *Exoprosopa* and *Litorrhynchus*.

Venation very distinctive; axillary cell very narrow, narrower than anal cell, basally extremely narrow; anal cell apically very dilated. Alula very narrow, poorly developed. Second longitudinal vein, which joins third vein immediately beyond cross-vein *r-m*, with a very large, rounded curve toward anterior border of wing and then another semicircular curve towards hind border; form of the last curve reminiscent of *Comptosia*.

Anterior tibiae with some spicules on underside at apex. Pulvilli absent, claws extremely short.

Type of genus: *O. tridentata* sp. n.

Ogilviella tridentata sp. n. ♂, ♀.

Ground colour of head deep black, shining, with, across the mouth cavity only, one narrow transverse yellow band. Cheeks extremely narrow, distinctly narrower than proboscis. Face very prominent, with short sparse black hairs. Mouth cavity broad, at base, nearly equal to one-third of head width. Palpi dark, very thin, with very long black hairs, their length nearly equal to length of style of third antennal segment. Vertex broad, in male occupying about one-seventh of head width, in female a little broader; frons covered with black, rather dense, erect hairs and a few whitish scales, which are visible only under a lens. Ocellar triangle very small. All three antennal segments approximately of same size and equal to ocellar triangle (excluding the very long style of third antennal segment). Occiput with very short, but dense, blackish hairs, and at hind margin of eyes with whitish scales.

Thorax black; bristles and very long and dense hairs along anterior border of mesonotum, on its sides and on upper parts of mesopleurae and pteropleurae, deep black. A

black tuft immediately before base of halteres, another tuft of pure white hairs on base of squamae. Disc of mesonotum nearly hairless, but covered with small yellowish scales, which are visible under a lens, but to the naked eye the mesonotum appears black. Halteres dark.

Wings not very long, narrow basally, rounded apically, with a rather broad black stripe along anterior border, extending to apex and occupying only a little less than half of wing. Boundary of this black area, in general, nearly straight, but with three indentations; the black in basal halves of axillary and anal cells extends to base of fourth posterior cell (forming the first indentation), then from apex of lower basal cell it extends to discal cell, occupying only a very small part at its base along vein m_1 to cross-vein *r-m* and penetrating into basal part of first posterior cell (occupying a very small part of it and forming the second indentation). From this point the boundary of the black area extends to the junction of r_{2+3} with a cross interradial vein (forming the small third indentation) and finally along vein r_{2+3} to its apex. The large rounded curve of this vein is not filled with black, which, moreover, extends only a little along anterior margin of wing to its apex.

All posterior cells with nearly parallel sides at apices. Anal cell open for a distance one and one-half times as long as vein *r-m*.

Legs black and reddish, but red colour nearly totally covered by black scales.

Abdomen deep black, shining, with sparse black hairs; only sides of first tergite with very dense deep black hairs. On anterior border of second tergite a very well-developed transverse band of scales, which are white on lateral thirds and yellowish on middle third; third tergite with a similar but not so well developed transverse band. Remaining tergites with only traces of similar bands. Underside of abdomen uniformly black, with very narrow, nearly invisible, whitish bands at hind borders.

Length of body 6–9·5mm., of wing 6·5–9·5 mm.

Holotype ♂ and 4 ♂ and 14 ♀ paratypes, Belgian Congo: Elizabethville, 11–17.ix.1931 (*J. Ogilvie; Miss A. Mackie; Mrs. L. Ogilvie*); Katanga, Biano, 8–11.viii.1931 (*J. Ogilvie*); Katanga, Tenke, 30.vii–9.viii.1931 (*Mrs. L. Ogilvie*).

The types (♂, ♀) in the British Museum; some paratypes in author's collection.

Pusilla gen. n.

Belongs to subfamily Usiinae: hind border of eyes absolutely entire; occiput very slightly prominent, not bilobate above and without a deep central cavity; occipital fringe almost absent; antennae approximate at base; prothorax and metasternum not specially developed; tibiae (femora also) only pilose, without rows of distinct spicules; all bristles on body absent. Cubital fork widely open, venation very similar to *Legnotomyia*, four posterior cells. Proboscis very long, in the type species as long as body. Palpi very thin, cylindrical, as long as mouth cavity, two-segmented, apical segment nearly bare, basal with long hairs. Two basal segments of antennae very short, rather broad and thick, first a little longer than broad, second twice as broad as long, third at least twice as long as the two basal segments together; viewed from the side, of an irregular egg-shape, at least twice as wide as second segment. Mouth cavity reaches to base of antennae, not deep, nearly as broad as sides of face; borders of cavity not high. Face very broad, equal to half of head width, frons in male also very broad, distinctly more than one-third of head width and three times as wide as ocellar triangle.

Head, thorax, scutellum and abdomen covered with very dense, long, erect hairs. Abdomen broad, oval, short, a little longer than and as broad as thorax. Hypopygium of male extremely solid and long. Two submarginal and four posterior cells. All posterior cells and anal cell widely open. Axillar cell (lobe) well developed, alula small, a little rounded, squamae long-haired. Legs without bristles.

Type of genus: *P. longirostris* sp. n.

Pusilla longirostris sp. n. ♂.

Ground colour of body black, only basal segment of palpi, veins at base of wings, halteres, tibiae and tarsi yellowish. The long erect hairs on body yellowish-white. Hairs on occiput and face distinctly shorter than on frons. Hairs on frons intermixed with brownish hairs. Hairs on basal two segments of antennae short, third segment bare. Ocellar triangle broader than long. Viewed in profile frons not prominent, face feebly so, also the chin. Sides of frons distinctly divergent. Wings hyaline, veins in basal half yellow, in apical half darkened. Vein *r-m* situated distinctly beyond, but not far from middle of discal cell. Anal cell at centre only slightly broader than at base or at apex. Ambient vein complete. Alula very sparsely haired. Origin of third longitudinal vein a little nearer to common stem of radial veins than to cross-vein *r-m*. Legs without bristles, but at apex of tibiae and on tarsi a few black, very short spicules. Pulvilli well developed. Femora with long hairs.

Length of body 4 mm., of wing 3mm.

Holotype ♂, Belgian Congo: Katanga, Biano, 8–11.viii.1931 (*T. D. A. Cockerell*). Type in the British Museum. 1 paratype ♂, same particulars as holotype.

Book Notices.

Transformations of Butterflies and Moths. By L. Hugh Newman. 8vo. London (Ward, Lock & Co.), 1952. Pp. 256, 8 pls. (col.), 150 photographs. Price 30*s*.

In this work the transformations of butterflies and moths are shown in some 146 " close-up " photographs and eight coloured plates.

There are concise notes on the life histories of the species discussed.

The Behaviour and Social Life of Honeybees. By C. R. Ribbands. 8vo. London (Bee Research Association Limited), 1953. Pp. 352, pls., text illust. Price 21*s*.

The author in his preface states that he has attempted to provide a comprehensive review of present knowledge of the behaviour and social life of honeybees.

The subject is dealt with in four parts: I. The roots of behaviour. II. Individual behaviour in the field. III. Communication between honeybees. IV. Life within the community. Particular emphasis is laid on the most recent researches and many experiments are reported for the first time. The language throughout is not strictly technical. Besides meeting the needs of research workers and students the volume should appeal to all readers of natural history as well, and be of practical help to beekeepers and fruit growers.

A TAXONOMIC STUDY OF THE FEMALES OF THE BRITISH *LUCILIA* SPECIES (DIPTERA : CALLIPHORIDAE).

By T. Spence, F.R.E.S.

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Seven species of *Lucilia* are found in Britain: *Lucilia sericata* (Meigen), *L. richardsi* (Collin), *L. silvarum* (Meigen), *L. illustris* (Meigen), *L. caesar* (Linn.), *L. ampullacea* (Villeneuve), and *L. bufonivora* (Moniez). All except *L. bufonivora* are normally carrion-breeders but some have developed the power to parasitise living sheep and *L. sericata* is regarded as the cause of loss to British hill sheep farmers greater than any other sheep disease.

It is not surprising that flies of such importance have been the subject of a great amount of investigation including experiments in which the relations between the different species and their environment were compared by means of trapping samples of the fly population. For example, Holdaway (1933) related the differing response of the various species to sunlight on the basis of captures in meat-baited traps. Very few males are caught in these traps as it is principally the females which are attracted and no key has yet been published which permits the separation of the females further than into groups of species. The males of the British species, however, can be readily identified by means of the key provided by Richards and Collin (1926). Attempts at the identification of the females captured in traps on the basis of the proportion of males included in the catch was found to be unreliable in the author's observations.

Richards and Collin (1926) stated merely that the females of British species could hardly be identified, while Aubertin (1933) in her revision of the world *Lucilia* provided a key for most species except for the females of the *L. caesar* group and forecast that it would be possible to find means of identification once pure cultures had been bred. This has been achieved in this present investigation by rearing pure cultures from single wild-caught female parents and by identifying these cultures by examination of the genitalia of the males. In this way it was possible to provide a large series of females of positive specific identity and subsequently to carry out the taxonomic investigation.

Rearing of Pure Cultures.

Single wild caught females taken from traps or netted on carrion or on flower heads, etc., were introduced into 2 lb. jars in which some 50 grams of fairly fresh liver had been placed on a layer of peat moss. These jars were covered with a muslin screen, secured by a stout rubber band and were maintained in fly-proof cages to prevent contamination by free-flying carrion flies laying their eggs through the muslin.

After some experience it was possible to separate gravid flies ready for oviposition from those at a less advanced stage. These females presented a solid, turgid abdomen, the pale yellowish-white egg-mass distending the pleural

and intersternal membranes. Flies distended with ingesta presented a more liquid turgidity, the crop contents showing greyish or red through the membranes. Flies confined in jars seldom survived more than 24 hours even though provided with food; in their excitement they became grossly contaminated with the liver of the culture and soon succumbed. Particular difficulty was found in persuading *L. richardsi* to oviposit in these jars; this species seemed especially wary and excitable. Oviposition was secured in the end, however, through the use of cages of a larger size.

The flies commonly oviposited within a few minutes after introduction to the meat. The larvae were permitted to develop undisturbed, apart from the addition of more food whenever necessary. The underlying peat litter provided good drainage from the liquifying liver and assisted the culture medium in maintaining a suitable consistency. Once development was completed and the maggots' crops began to empty they began to leave the food. At this stage the larvae were freed from the remains of the liver and transferred to new jars, half filled with peat moss that was just moist. This pupation medium proved to be the most acceptable of all those tried; the maggots burrowed into it without any wandering and after a very short prepupal period the majority pupated and in due course emerged. The periods occupied by the different stages in the life cycle showed specific differences: for example at 25° C. *L. illustris* took an average of 13·8 days and *L. caesar* took 15·6 days to complete the period egg to emergence of adults. It was not necessary to retain all the cultures until emergence had begun, as it was possible, by dissection of male flies still in the puparia, to identify the culture and discard any that were not wanted. In those cultures which were required for study the adults were released into small cages and allowed to feed for three days to ensure full sclerotisation of the integument. At least 20 females from each culture were pinned in various positions and in addition microscopical preparations were made of many organs. All seven species have been bred in numbers. In the early stages, *L. silvarum* and *L. richardsi* were only rarely found, but more recently the habitats of these species have been discovered and the flies have been bred abundantly. With the exception of *L. bufonivora*, of which some 27 cultures have been bred, some from naturally infested toads, some from cultures maintained in the laboratory on live toads, at least 50 cultures of each (of the other) species have been made and in the "*caesar*" group in which the present interest lies, over 100 cultures of each of the three species have been reared.

Examination of the Specimens.

Preliminary investigations were first made on a large number of specimens to test the value of the keys published by Stein (1924), Séguy (1928) and by Richards and Collin (1926). The characters used for diagnosis are discussed separately in the following paragraphs:

Post-sutural acrostichal chaetae.—Three pairs of post-sutural acrostichals distinguish *L. sericata*, *L. richardsi* and *L. silvarum* from the other species which have only two pairs. In all species, however, aberrations were encountered and in some species with some frequency. This has varied from occasional supernumerary bristles or suppressed bristles in wild caught flies to strains of

L. silvarum with 2 or $2\frac{1}{2}$ pairs which have transmitted this character to their offspring through several generations and of cultures of *L. illustris* in which the presence of supernumerary bristles also persisted in the progeny. In reared specimens of *L. bufonivora*, specimens, usually males, were found which had only one pair of post-sutural acrostichals and in other cultures, specimens were seen with three pairs, thus resembling *L. silvarum*.

Basicostal scale.—The colour of this structure is only slightly variable in the species with a pale scale; in *L. richardsi* specimens were occasionally found in which the scale was greyish horn-coloured rather than yellowish.

Marginal macrochaetae.—No specimens of *L. bufonivora* or *L. silvarum* of either sex were examined in which the strong upright marginal bristles on tergite III (the second obvious abdominal tergite) were absent. In the females of both species at least one pair of such bristles was present while in the males two pairs was the usual condition. Occasionally with *L. bufonivora* additional upright, discal macrochaetes were developed.

Width of the frons.—This character is variable and in the series examined the measurements in the various species overlapped so that, by itself, the character is of little value.

Palpi.—In the "*L. caesar*" group and *L. sericata* the colour was fairly constant, usually a dull orange yellow. In *L. silvarum* the colour was invariably sooty-black with a fine silvery pubescence. In *L. bufonivora* it was commonly dark greyish brown with a more orange-brown pubescence. The palpi of *L. richardsi* were much darker than those of *L. sericata* and the colour was found to deepen with age to a dusky horn colour, darkest at the tip.

Antero-dorsal bristles on middle tibia.—The possession of two antero-dorsal bristles on the middle tibia characterises *L. richardsi;* the other British species have only one such bristle. In a few females, however, only one bristle was present and in this circumstance the single bristle was very strongly developed. This aberration was usually symmetrical but there was no difficulty in distinguishing females of *L. richardsi* from *L. sericata*, the tomentose abdomen of *L. sericata* being easily recognised.

Making use of the characters of the genitalia, it is easy to identify the males of all British species of *Lucilia* and bearing variations in mind to recognise all the females except those of *L. caesar*, *L. illustris* and *L. ampullacea*. In the search for characters to identify these flies the following organs were examined: the colour and chaetotaxy of the palpi; the labellum, theca, epipharynx and sclerotised structures of the haustellum; the antennae and aristae; the proportions of the frons to the parafrontal prolongation of the gena; the proportion of the ocellar triangle to the frons; the frontal, parafrontal, post-orbital and ocellar bristles; the shape and chaetotaxy of the abdominal sternites; the sclerites of the ovipositor and the spermathecae; the venation, particularly the chaetotoxy of the petiole of R_{2+3} and remigium; the colour and structure of the squamae and halteres; the chaetotaxy of the legs and the number, position and proportion of the humeral, acrostichal, notopleural, dorso-central, sublateral, posthumeral, presutural, supraalar, postalar, sternopleural, hypopleural and scutellar bristles. Of these structures only the labellum, antennae, aristae, and ovipositor provided characters the proportions or structures of which distinguished the species without overlap. The most important distinguishing character was provided by the ovipositor.

The labellae.—The labellum of *L. ampullacea* is noticeably larger and flabbier than that of the other species. This is related to the number of supporting pseudotracheae in the organ; in *L. ampullacea* the average is 30 and the range 29–32, in *L. caesar* the average 25, ranging from 24–26, and in *L. illustris* the average 19, ranging from 17–20. These figures were derived from preparations made from 20 females of each species taken at random from several cultures.

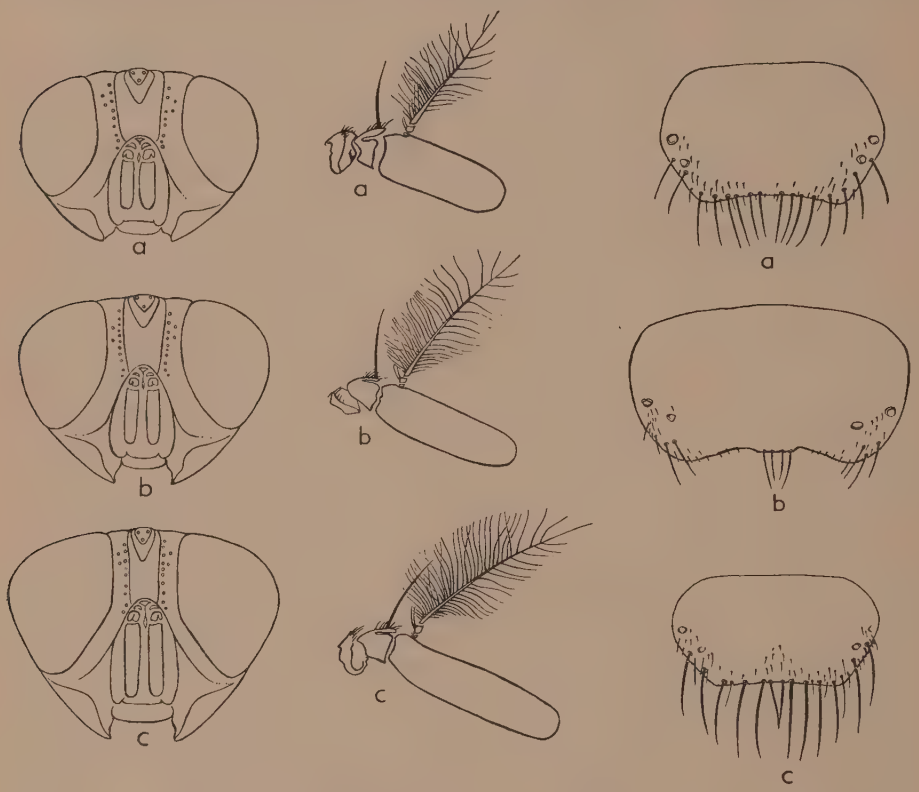

Fig. 1.—*Left:* Heads of the female flies of the group "*L. caesar*" to illustrate the proportions of the antennal length to the breadth of the frons and the parafrontalia.
Centre: Antennae of the flies of the group "*L. caesar.*" Note the proportions of the third article, length to breadth, and the numbers of the setae on the inferior face of the arista.
Right: Ovipositors of the flies of the group "*L. caesar.*" Note the chaetotaxy and postero emargination in *L. caesar.*
a. L. illustris (Meigen). *b. L. caesar* (Linn.). *c. L. ampullacea* (Villeneuve).

The antennae.—The proportions of the third segment of the antenna differ in the three species, though this character alone is not sufficient for identification. It is most convenient to express the dimensions as a proportion of length to breadth and also in relation to the width of the frons and parafrons. In *L. ampullacea* the third segment exceeds the combined breadth of the frons

and both of the parafrontalia, the proportion of length to breadth being 4·2 : 1 ; in *L. caesar* the third segment equals the breadth of the frons plus one parafrons, the proportion of length to breadth being 3·1 : 1 ; and in *L. illustris* the third segment equals the breadth of the frons only and the proportion of length to breadth was found to be 2·5 : 1. These characters are illustrated in fig. 1.

The arista.—The fine setae on the arista are arranged in two superior and one inferior series. The number of setae in the inferior series, though variable in each species, does not overlap. In *L. ampullacea* the average is 20 and the range 18–21 : in *L. caesar* the average 15, ranging from 13–17, and in *L. illustris* the average 11 and the range 9–12. These antennal and aristal characters

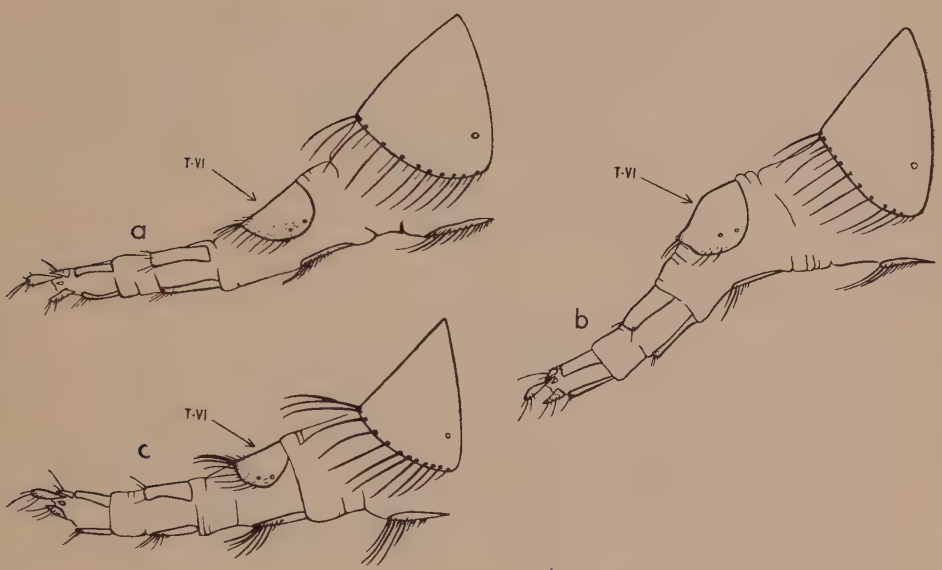

Fig. 2.—Secondary ovipositor (i.e., the segments normally telescoped into the abdomen) of the flies of the group "*L. caesar*." Note the profile and chaetotaxy in "*L. caesar*" of tergite VI, indicated by arrow. *a. L. illustris* (Meigen). *b. L. caesar* (Linn.). *c. L. ampullacea* (Villeneuve).

were found on making preparations of 8 pairs of antennae from females taken at random from 10 cultures of each species. The antennal and aristal characters are illustrated in fig. 1.

The ovipositor.—While there are minor differences in several of the sclerites of the secondary ovipositor, in the first superior sclerite (tergite VI) these differences are very marked. In *L. illustris* and *L. ampullacea* the sclerite is nearly straight in profile and has a complete series of marginal chaetae ; in *L. caesar*, on the other hand, the plate has a curved profile when viewed from the side and reflects to a minor degree the inflation which is such a marked character of this tergite in the male of *L. caesar*. In addition, all but the central pair or two pairs of the marginal bristles are suppressed. This character

of the tergite is easily seen with a lens in the living specimen if the ovipositor is slightly extruded by light pressure on the abdomen. Full extrusion of the ovipositor provides yet another aid to identification, though the flies rarely survive the forced pressure: in *L. ampullacea* and *L. illustris* the extended ovipositor lies at an angle of about 30° to the axis of the abdomen, in *L. ceasar* the shape of tergite VI deflects the direction of the organ and the extended ovipositor lies at some 90° to the axis of the abdomen. These characters are illustrated in figs. 1 and 2.

These characters in the ovipositor were found to be invariable and have been confirmed by examination of many hundreds of specimens and by breeding from wild flies caught and identified by this character.

Identification of Females of *Caesar* Group.

The ovipositor character allows easy and rapid identification of live specimens of *L. caesar*. The ovipositor alone is not sufficient, however, for identification of *L. illustris* and *L. ampullacea*, though the marginal bristles are much stouter, longer and more upright in *L. ampullacea*. Once *L. caesar* has been removed from a series the other two species can readily be identified on the relation of the length of antennae to breadth of the frons.

Key to Females of British Species of the Genus *Lucilia*.

1. Three pairs of post-sutural acrostichals, except in abnormal specimens . 2
–. Two pairs of post-sutural acrostichals (or fewer) except in abnormal specimens 4
2. Basicostal scale black; palpi sooty or black; two or more upright marginal macrochaetae on the second obvious abdominal segment (T. III); T. II blackish-blue . . . . . **L. silvarum**
–. Basicostal scale yellow or horn coloured; palpi dull yellow to dark-horn coloured; no upright marginal macrochaetae on T. III; abdomen unicolorous 3
3. Palpi yellow to light-horn; silvery tomentum over abdomen; one antero-dorsal bristle on middle tibia; third segment of antennae equal to width of frons only; eyes reddish in life . . . . **L. sericata**
–. Palpi horn-coloured, darker at tip; no tomentum; two antero-dorsal bristles on middle tibia; third segment of antennae equal to frons and both parafrontalia combined; eyes chocolate in life . . **L. richardsi**
4. Two or more stout upright marginal macrochaetae on T. III; T. II dark blackish blue; palpi grey brown . . . . . **L. bufonivora**
–. No differentiated marginal macrochaetae on T. III; abdomen unicolorous; palpi dull yellow orange 5
5. Secondary ovipositor, T. VI, slightly inflated, only one or two pairs of very short marginal bristles in the mid-line . . . . . **L. caesar**
–. Secondary ovipositor, T. VI straight in profile, complete series of marginal bristles 6
6. Third segment of antenna greater in length than the width of the frons and both parafrontalia combined. Third segment of antenna more than four times longer than its breadth . . . . . **L. ampullacea**
–. Third segment of antenna equal only to the width of the frons. Third segment of antenna less than three times as long as broad . **L. illustris**

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Acknowledgment.

This work was begun at Imperial College Field Station, then at Slough, Bucks. I am indebted to Professor J. W. Munro for the facilities that were provided and I am grateful to Dr. O. W. Richards for his supervision and encouragement.

NOTES ON THE AUSTRALIAN RUTELINAE (COLEOPTERA) AND DESCRIPTION OF A NEW GENUS.

By P. B. Carne.[1]

Leconte and Horn (1883, *Class. Col. N. Amer.*), discussing the Dynastinae, remarked that " insensible transitions through foreign genera connect closely this (subfamily) with the preceding (the Rutelinae)." In the course of a systematic revision of the Australian Dynastinae I have found the existence of annectent genera to be a source of major difficulty ; indeed it will be necessary to modify the existing characterisation of the subfamily in order that certain genera and species may be decisively placed in one or other of the two subfamilies.

As a result of my studies I have concluded that at least two of the species described by Lea in *Aneurystypus* are Rutelines, belonging to an undescribed genus closely allied to *Mesystoechus* Waterhouse. For these and for two new species described in this paper, I propose the new genus *Dynastomorphus*.

Dynastomorphus gen. n.

Type species : *Aneurystypus pachypus* Lea.

Small (*ca.* 8–13 mm.) reddish-brown to reddish-black species, antennae and abdominal sternites lighter in colour, femora and tibiae suffused with black.

Mentum densely setose, moderately compressed ; maxillae with galeae reduced to small untoothed processes, palps with third segment not more than one third the length of the terminal segment, the latter tapering. Mandibles rounded, produced beyond clypeus ; labrum exposed, transverse, setose, rounded anteriorly. Antennae 10-segmented, inner face of 3-segmented club and first two segments setose. Clypeus evenly rounded, very strongly emarginate, often constricted at antennal angles ; clypeofrontal ridge transverse or anteriorly arcuate.

Pronotum evenly convex and punctate on disc ; anterolateral angles obtuse, margins and disc commonly setose ; posterior margin with a fine continuous ridge. Elytral striae irregularly punctate, epipleurae narrow with lateral setae abundant and present to elytral apices, extending anteriorly along sutural margins. Lateral margins usually membranous. Fore tibiae moderately to very acutely tridentate, often with spur lacking ; tarsi elongate, slender, first and fifth segments equal in length on all legs. Claws delicate, slightly unequal but not toothed. Middle and hind legs short, tibial spurs sharp, short, unequal ; tarsi with first segment slender. Coxae, thoracic and abdominal sternites with abundant pale vestiture. Postcoxal process of prosternum small, not forming a free columnar process, rarely visible. Middle coxae contiguous.

Pygidium elongate, somewhate truncate at apex, abundantly setose on disc.

Male : antennal club slender, often sinuate, longer than shaft. External genitalia slender, gonostyli contiguous dorsally, aedeagus being exserted ventrally (fig. 3). Head and pronotum quite unarmed.

Female : not known.

Dynastomorphus, while close to *Aneurystypus*, is even more closely related to *Mesystoechus* Waterh. (cf. genitalia in figs. 2–3 and 7–8). From the former

[1] Part of work carried out during the tenure of a Studentship from the Australian Commonwealth Scientific and Industrial Research Organisation.

it differs in its slight claw asymmetry, its elongate pygidium, strongly rounded clypeus, the more extensive setation of its dorsal surface, its tendency to possess membranous elytral margins and its totally different type of male genitalia (cf. figs. 2–3 and 11–12). From *Mesystoechus* it differs in its untoothed anterior claws, its lack of a pronotal colour pattern and in its very strongly emarginate clypeus; the distal margins of its hind tibiae also differ in that *Mesystoechus* has the typically ruteline formation of a row of ciliae extending across the insertion of the spurs (fig. 6). The known species of *Dynastomorphus* are found in the arid regions of South Australia and Central Australia.

Key to Species of *Dynastomorphus*.

1 Fore tibiae very slender, teeth tapering and very sharp (fig. 17), lacking spurs. Mandibles broadly rounded, hypognathous, not strongly exposed. Clypeus about as long as wide, strongly and evenly subcircular in outline (fig. 1), contracted near antennal angles. Clypeofrontal suture transverse. Epipleurae with lateral margins conspicuously membranous . . . . . 2.

Fore tibiae strongly but coarsely tridentate (fig. 16), spurs present. Mandibles narrow, prognathous, very strongly exposed. Clypeus very short, outline as in figs. 5, 9. Clypeofrontal suture anteriorly arcuate; epipleurae with very narrow membranous margins or with margins corneous . . . . . 3.

2 (I) Disc of frons and pronotum glabrous, clypeus very closely and finely punctate, surface dull. Clypeofrontal suture in same plane as frons. Outline of pronotum as in fig. 13. Length *ca.* 11–13 mm. **pachypus** (Lea)

– Disc of frons and pronotum setose, clypeus impunctate and shining. Clypeofrontal suture depressed in sulcus. Outline of pronotum as in fig. 15. Length *ca.* 9–10 mm. . . . . **pilosicollis** (Lea)

3 (I) Reddish-brown species with pronotum impunctate on narrow postero-median area, the punctures irregular, transverse. Head as in fig. 9. Pygidium with decumbent white setae in addition to longer pale erect vestiture. Elytra with very narrow membranous margins. Length *ca.* 9 mm. . . . . **mandibularis** sp. n.

– Reddish-black species with pronotum evenly and coarsely punctate, the punctures circular. Head as in fig. 5. Pygidium with pale erect vestiture only. Elytra with margins corneous. Length *ca.* 8 mm. . . . . **angularis** sp. n.

Dynastomorphus pachypus (Lea) **comb. nov.** (figs. 1, 2, 3, 13).

Aneurystypus pachypus Lea, 1917, *Trans. roy. Soc. S. Aust.* **41** : 568.

The terminal segments of the maxillary palps are markedly swollen proximally and each bears a large oval sensorium. The clypeofrontal suture is in the plane of the frons but below that of the clypeus. Although the frons is glabrous in the middle, it bears a few small setae on the ocular margins. The epipleural setae extend over the posterior third of the sutural margins of the elytra, while similar setae are scattered on the surface of the elytra posterior to the subapical calli. The inner tarsal claws are slightly coarser than the outer. The male genitalia are illustrated in figs. 2 and 3. I have before me two of Lea's specimens, both taken at Ooldea, S. Australia.

Dynastomorphus pilosicollis (Lea) **comb. nov.** (figs. 15, 17).

Aneurystypus pilosicollis Lea, 1917, *Trans. roy. Soc. S. Aust.* **41** : 569.

In this species the terminal segments of the maxillary palps are not appreciably swollen at the base; the clypeofrontal suture lies in a distinct sulcus. The frons is depressed in an anteromedian area and bears sparse long setae. The epipleural setae extend on to the posterior sixth of the sutural margins of the elytra, but do not occur on the surface, although the extreme bases bear long pale setae similar to those borne by the scutellum. The inner tarsal claws are not appreciably coarser than the outer.

I have seen a single specimen from Ooldea, S. Australia, collected by Lea.

Dynastomorphus mandibularis sp. n. (figs. 9, 10, 16).

Reddish-brown, about 9 mm. in length.

Mentum short, slightly compressed; labial palps extremely small. Terminal segments of maxillary palps slender, mandibles strongly produced, narrow, rounded at apices and appreciably recurved. Labrum somewhat deflexed ventrally. Clypeus very short, strongly emarginate (fig. 9), clypeofrontal suture a fine anteriorly arcuate line. Head with abundant shallow punctation. Pronotum with all margins setose, disc with lightly impressed, rather irregular punctures, and with a narrow posteromedian impunctate area. Outline of pronotum as in fig. 10. Scutellum punctate on anterior half.

Elytra with irregularly punctate striae confused by punctate intervals; posterior half with short white setae similar to those borne by the epipleurae; the latter with ventral setae poorly developed and with very narrow membranous margins.

Fore tibiae coarsely tridentate (fig. 16), spurs present. Hind legs short, moderately stout, tibiae bicarinate.

The punctures on the posterior half of the pronotum appear to be concentrically disposed about a point on the middle of the hind margin; each has the appearance of a pair of partially fused circular punctures. *D. mandibularis* may be distinguished from its congeners by the characters given in the key above.

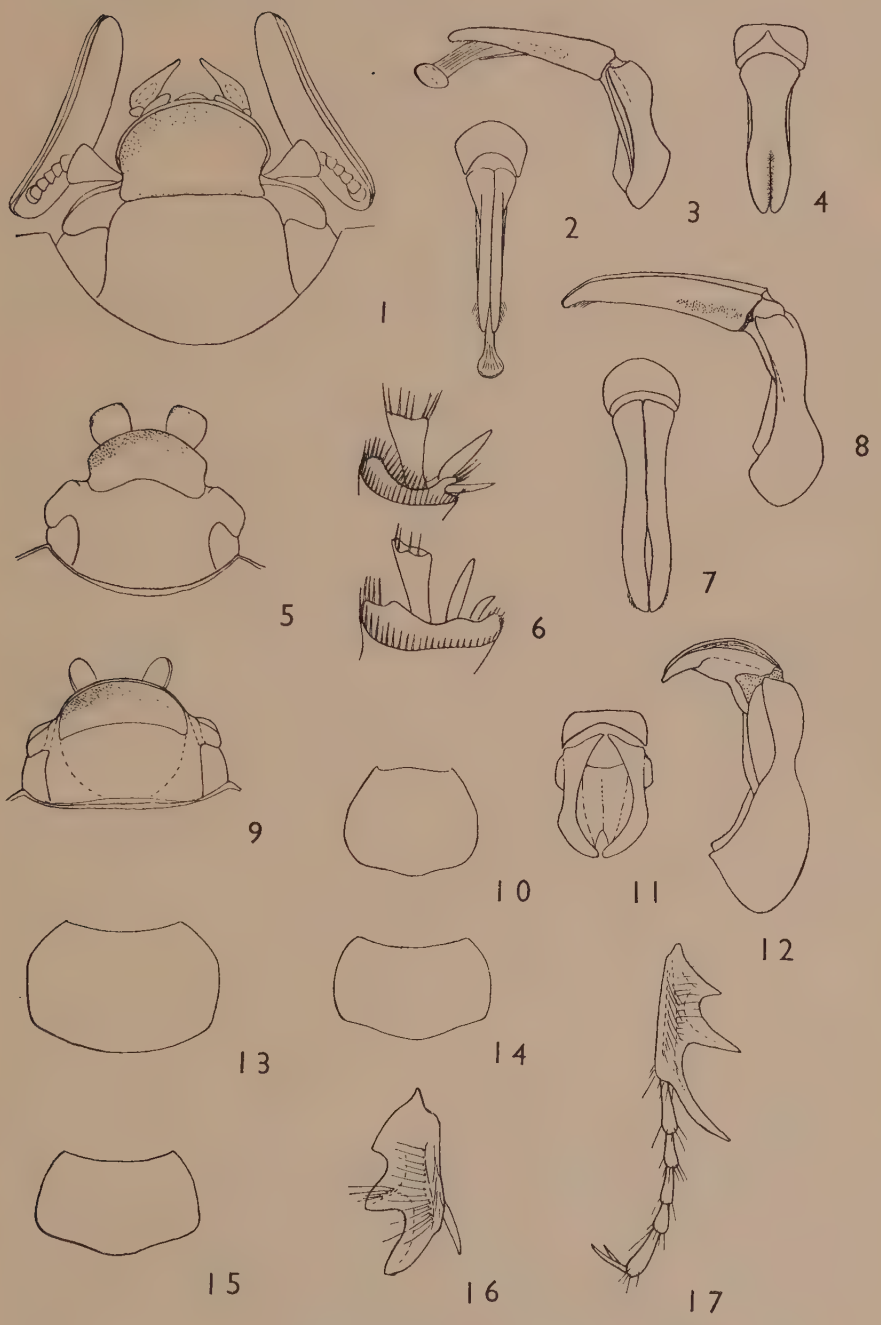
Holotype male, South Australia: Purple Downs, Pt. Augusta (*H. Greenfield*). In South Australian Museum.

Dynastomorphus angularis sp. n. (figs. 5, 14).

Reddish-black, about 8 mm. in length.

Mentum short, slightly compressed; terminal segments of maxillary palps slender. Mandibles strongly produced, slightly angulate, moderately broad (fig. 5). Clypeus very short, strongly emarginate, clypeofrontal suture as in *mandibularis*, the surface of the clypeus smooth, shining; frons coarsely, concentrically rugose. Pronotum sparsely setose on all margins, disc glabrous, coarsely and evenly punctate, outline as in fig. 14.

Figs. 1–17.—(1–3) *Dynastomorphus pachypus* (Lea) comb. nov. (1) Head, dorsal (2) Male genitalia, dorsal. (3) Male genitalia, lateral. (4) *Saulostomus collaris* Blackburn. Male genitalia, dorsal. (5) *Dynastomorphus angularis* sp. n. Head, dorsal. (6) *Mesystoechus ciliatus* Waterhouse (upper) and *D. pachypus* (Lea). Margins of hind tibiae compared. (7, 8) *Mesystoechus ciliatus* Waterhouse. Male genitalia, (7) dorsal; (8) lateral. (9, 10) *Dynastomorphus mandibularis* sp.n. Head. (9) dorsal; (10) lateral. (11, 12) *Aneurystypus richardsae* Blackburn. Male genitalia, (11) dorsal; (12) lateral. (13) *Dynastomorphus pachypus* (Lea). Pronotal outline, dorsal. (14) *D. angularis* sp. n. Pronotal outline, dorsal. (15) *D. pilosicollis* (Lea). Pronotal outline, dorsal. (16) *D. mandibularis* sp. n. Fore tibia, dorsal. (17) *D. pilosicollis* (Lea). Fore tibia and tarsus.



Australian Rutelinae (Coleoptera).

Scutellum sparsely punctate, elytra with conspicuously impressed striae. Epipleurae with margins corneous, without discernible ventral setae; lateral setae extending on to posterior third of sutural margins but not occurring on surface of elytra. Fore tibiae coarsely tridentate.

Male: antennal club very narrow, longer than shaft.

The punctures on the pronotum are of the usual circular type; the hind legs are robust but more slender than in *mandibularis*. Other characters separating *angularis* from its congeners are given in the key above.

Holotype male, CENTRAL AUSTRALIA: Emily Plains (*C. J. Hackell*). In South Australian Museum.

There is a distinct probability that two other species of *Aneurystypus* (*inermicollis* and *carinaticeps* Lea) may be properly referred to *Dynastomorphus*. Lea's descriptions of these two species do not provide quite sufficient information for certainty on this point, and the types are not accessible at the present time.

The borderline systematic position of *Aneurystypus* is further shown by the fact that another species, at first referred to it (*collaris* Blackburn), has been transferred to a ruteline genus. Blackburn placed this species in *Saulostomus* on finding it had typically ruteline claws and mouthparts (his original type lacked tarsi). Lea has expressed himself to be "very dubious" about the validity of this transfer but I have no doubt as to its correctness. In addition to the characters noted by Blackburn, *collaris* has a broadly membranous elytral margin, a character not occurring in any dynastine. The external male genitalia are quite ruteline in character and I illustrate them together with those of a typical *Aneurystypus* (*richardsae* Blackburn), in figs. 4 and 11–12.

That *D. pachypus*, *D. pilosicollis* and *S. collaris* were all originally referred to the same genus would suggest a fairly close relationship between the two genera; yet *Mesystoechus* Waterhouse, to which *Dynastomorphus* is very closely related, is regarded by Ohaus (1918, *Col. Cat., Rutelinae*)—I believe wrongly—to be systematically quite remote from *Saulostomus*.

Ohaus has placed *Aneurystypus* as a possible synonym of *Saulostomus* Waterhouse, and *A. pauxillus* Blackburn, as a possible synonym of *S. villosus* Waterhouse. As neither of these is correct, as *S. collaris* is not listed and as three further species have been described since the catalogue was published, I take this opportunity to revise the list of species of this genus.

Saulostomus Waterhouse, 1878.

Waterhouse, 1878, *Trans. ent. Soc. Lond.* **1878**: 225; Ohaus, 1904, *Stettin. ent. Ztg.* **64**: 68, 153.

brunneoviridis Lea, 1920, *Proc. Linn. Soc. N.S.W.* **44**: 743. New South Wales.

collaris Blackburn, 1892, *Proc. Linn. Soc. N.S.W.* (II) **7**: 286; 1908, *Trans. roy. Soc. S. Aust.* **38**: 80. S. & W. Australia.

felschei Ohaus, 1904, *Stettin. ent. Ztg.* **65**: 156. Australia.

mimicus Lea, 1919, *Trans. roy. Soc. S. Aust.* **43**: 247. Queensland.

striatus Ohaus, 1935, *Dtsch. ent. Z.* **1935**: 126. Queensland.

villosus Waterhouse, 1878, *Trans. ent. Soc. Lond.* **1878**: 225; Ohaus, 1898, *Stettin. ent. Ztg.* **59**: 39; 1904, *l.c.* **65**: 154. Queensland, New South Wales, Victoria, Tasmania.

weiksei Ohaus, 1904, *Stettin. ent. Ztg.* **65**: 157. N. Queensland.

NOTES AND DESCRIPTIONS OF THYSANURA (APTERYGOTA).

By Petr Wygodzinsky.

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The present notes are based upon specimens belonging to the British Museum (Natural History) and submitted for identification by Miss Theresa Clay, to whom it is a pleasure to acknowledge my indebtedness.

Machilidae.

Pseudomeinertellus gen. n.

Meinertellinae.—Medium sized; appendages of normal length. Hypodermal pigment present. Scales absent from mouthparts, antennae, head, legs and abdominal stylets.

Antennae slender, about as long as, or longer than, body; their articles without special sensillae, with simple hairs and bristles only. Eyes slightly wider than long. Paired ocelli large, dumbbell-shaped, situated before anterior border of eyes. Mandibles with four teeth. Maxillary palp of male with hook-shaped process on apex of third article. Last segment of labial palp widened apically.

Legs without coxal appendages; ventral surface of articles without spine-like setae. Hairs on ventral surface of tarsi very numerous, those of third segment forming a not sharply limited brush-like formation which occupies practically the whole ventral surface of that segment; these hairs slightly S-shaped, somewhat bent and widened at apex, not sculptured, with a strongly chitinised minute cone-shaped structure at their base.

Median portion of urosternites minute. Stylets on segments II–IX, 1 + 1 exsertile vesicles on segments II–VII. Apical spine of sternites hyaline, very elongate. Posterior coxites without spiniform setae. Ovipositor of primary type, slender, elongate, glabrous on its basal half, with irregularly arranged short and long setae on the remaining segments. Penis relatively large, the apical portion smaller than the basal one, its opening elongate, ventrally situated; apex and ventral surface of penis with numerous specialised setae arranged in various series, groups and fields.

Filamentum terminale about as long as body, cerci about half the length of the former. Cerci with some delicate hairs and several strongly pigmented short spine-like setae; scales of caudal appendages narrow, slightly emarginate apically.

Type of genus: *Pseudomeinertellus snowi* sp. n.

Superficially, the new genus resembles *Meinertellus* Silvestri, 1904; thus, the only species previously known has been described (Silvestri, 1908) as *Meinertellus feae*. The two genera have in common, among other characters, the presence of specialised hairs on the ventral surface of the third tarsal segment. In *Meinertellus* they form a sharply limited and strongly pigmented apical brush-like group (fig. 14); the individual hairs are finely sculptured and pointed apically (figs. 15, 16). In *Pseudomeinertellus*, these hairs are very numerous but do not form a sharply limited apical brush (fig. 6); the individual hairs show no sculpture, and their point is as described above (fig. 7). The chaetotaxy of the penis of *Meinertellus* (fig. 28) is much simpler than that of *Pseudomeinertellus* (fig. 27). The new genus might equally be compared to the group

of genera around *Machilellus* Silvestri, 1911 ; also in this case the peculiar tarsal hairs furnish the best differential character.

So far *Pseudomeinertellus* is only known from São Tomé, where three species have so far been found. They can be determined as follows :

1. Line of contact less than half the length of eyes (fig. 1) . . **snowi** sp. n.
— Line of contact half the length of eyes, or slightly longer (fig. 18) . . 2.
2. Apical segment of maxillary palp about as long as penultimate (as in fig. 3); ocelli distinctly widened at inner extremity (as in figs. 1, 2) **feae** (Silvestri, 1908)
— Apical segment of maxillary palp much shorter than penultimate (fig. 20) ; ocelli not distinctly widened at inner extremity (figs. 17, 18) **gradwelli** sp. n.

The presence of three species of one genus within such a small territory as the Island of São Tomé is not quite so surprising if we consider the rather high altitude of the mountains (6700 ft. for the Pico de São Tomé where the specimens described here were collected). It is a well-known fact that the vertical distribution of the machilid species is very limited in a given region and generally is not expected to exceed 3000 ft. The São Tomé species described before, *feae* (Silvestri), was found between 400–700 m.

Pseudomeinertellus snowi sp. n.

Female.—Length of body 11·0 mm. Pattern unknown. Hypodermal pigment present, faint and diffuse on mandibles, labial palp and legs, its exact distribution difficult to make out ; on head rather similar to that shown in fig. 17, upper half of clypeus with a diffuse spot in middle ; scapus of antennae with a large basal and apical spot connected by a longitudinal stripe, pedicellus also pigmented ; pigmentation of maxillary palp as in fig. 3.

Pattern of eyes unknown ; their shape as in figs. 1, 2 ; line of contact : length = 0·35, length : width = 0·8. Ocelli (figs. 1, 2) considerably swollen at inner extremity.

Antennae at least as long as body, delicate, uniformly light brownish ; segments as in generic description and as in fig. 19 ; on apical portion of flagellum subdivided into up to 26 subarticles.

Shape and relative length of articles of maxillary palp as in fig. 3 ; apical segment slightly longer than penultimate.

Labial palp as in fig. 4, last segment very considerably widened apically, its anterior surface with several rows of sensillae (as in fig. 23).

Legs and their bristles as in generic description and figs. 5–7.

Urosternites and stylets as in generic description and figs. 8–10. Stylets of anterior segments rather approximate, consecutively less so towards behind ; apical spine hyaline, surpassing two thirds of the length of the stylets (one half on stylets IX). Relation of length stylet : coxite on segments II–VII = 0·7, VIII = 0·75, IX = 0·55.

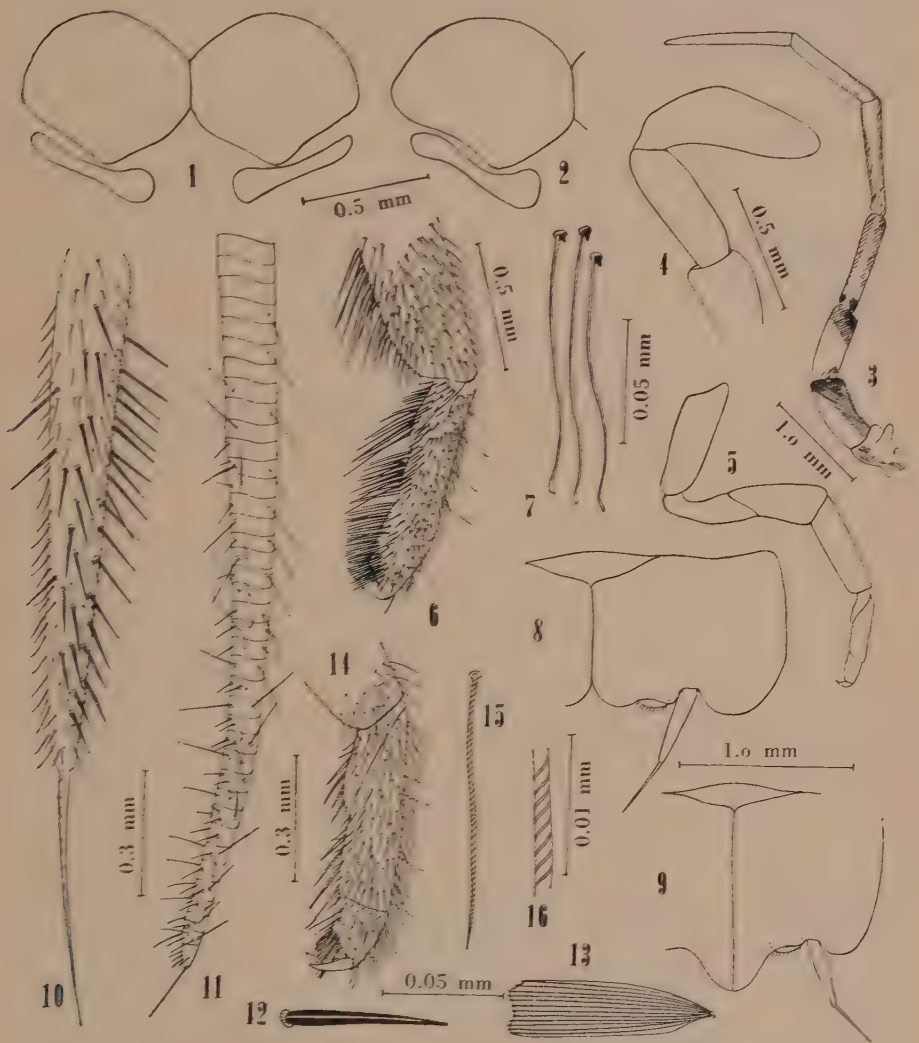
Ovipositor surpassing tip of apical spines of stylets IX by half the length of the former. Anterior gonapophyses with 66–73 articles ; those of basal half bare, the remainder with very irregularly distributed long and short bristles, with never more than two long bristles on each article (fig. 11). Posterior gonapophyses similar, but never more than one long bristle on each article.

[1] Holotype female, São Tomé : Pico de São Tomé, 6700 ft., 11.ix.1949 (*G. R. Gradwell*). In British Museum (Nat. Hist.).

Pseudomeinertellus snowi sp. n. approaches the other species of the genus

[1] This and the specimens of the following species were collected by G. R. Gradwell and D. Snow on the Oxford University Expedition to São Tomé in 1949.

known by the female only, *P. feae* (Silvestri). The new species differs by several characters, such as the very short line of contact of the eyes, the longer ovipositor and the greater relative length of the stylets of the anterior abdominal segments.



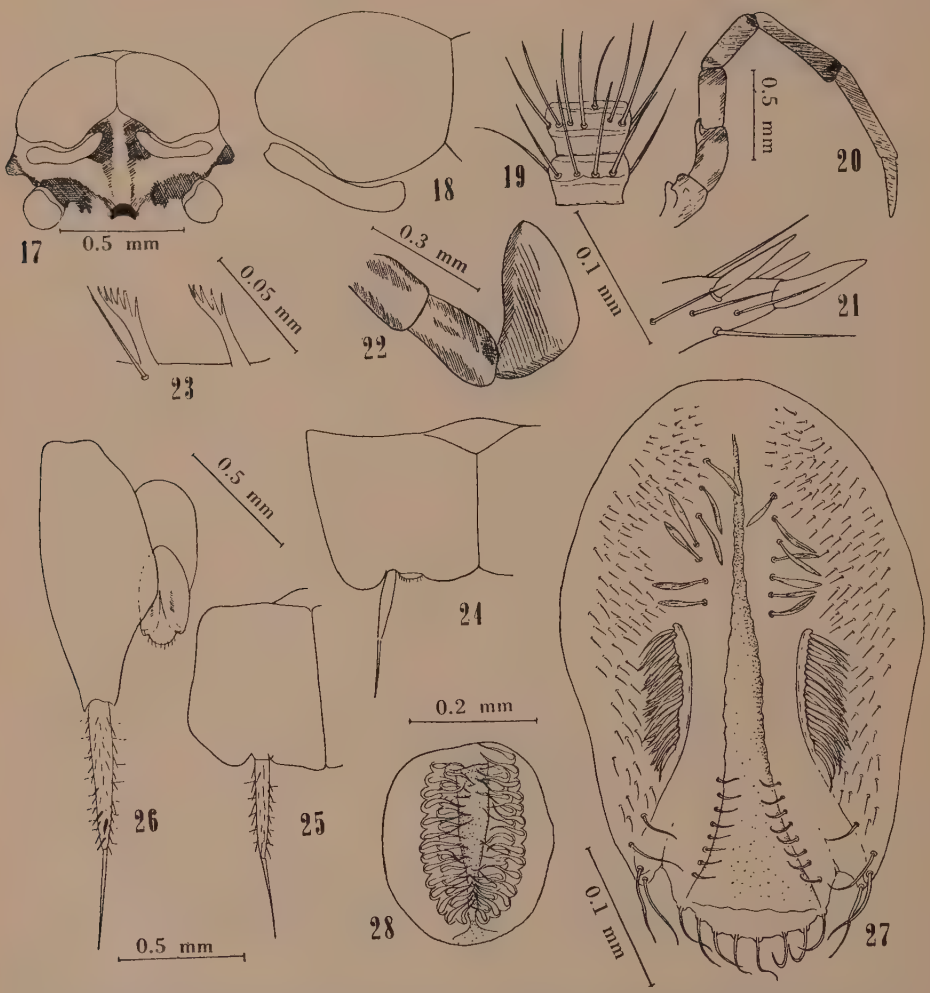
FIGS. 1–16.—*Pseudomeinertellus snowi* gen. et. sp. n., female. (1) eyes and ocelli, frontal aspect; (2) eye and ocellus, lateral view; (3) maxillary palp; (4) labial palp, pigment not shown; (5) hind leg; (6) apex of tibia and tarsus of hind leg; (7) specialised hairs of ventral surface of third tarsal segment; (8) urosternite V; (9) urosternite VII; (10) stylet IX; (11) apical half of anterior gonapophysis; (12) spine-like seta of cercus; (13) scale of cercus, *Meinertellus* sp. (Venezuela); (14) apex of tibia and tarsus of hind leg; (15) specialised hair of brush-like group on ventral surface of third tarsal segment; (16) the same, a portion seen with high magnification. Wygodzinsky del.

Pseudomeinertellus gradwelli sp. n.

Male.—Length of body 7·5 mm. Pattern unknown. Hypodermal pigment present, approximately as described for *P. snowi*; on head, maxillary and labial palps as in figs. 17, 20 and 22.

Pattern of eyes unknown; their shape as in fig. 18. Line of contact: length = 0·6, length : width = 0·85. Ocelli (figs. 17, 18) not distinctly swollen at inner extremity.

Antennae about as long as body, delicate, uniformly brownish; segments of apical portion of flagellum divided into up to 20 subarticles (fig. 19).



Figs. 17–28.—*Pseudomeinertellus gradwelli* sp. n., male. (17) head, frontal aspect; (18) eye and ocellus, lateral view; (19) subarticle of distal portion of flagellum of antenna; (20) maxillary palp; (21) apex of distal segment of maxillary palp; (22) labial palp; (23) sensillae of labial palp; (24) urosternite V; (25) urosternite VIII; (26) urosternite IX with penis; (27) ventral surface of apical portion of penis, slightly flattened by cover slide; (28) *Meinertellus* sp. (Venezuela) ventral surface of apical portion of penis. Wygodzinsky del.

Shape and relative length of articles of maxillary palp as in fig. 20 ; last segment much shorter than penultimate, spine-like setae of its apex elongate (fig. 21).

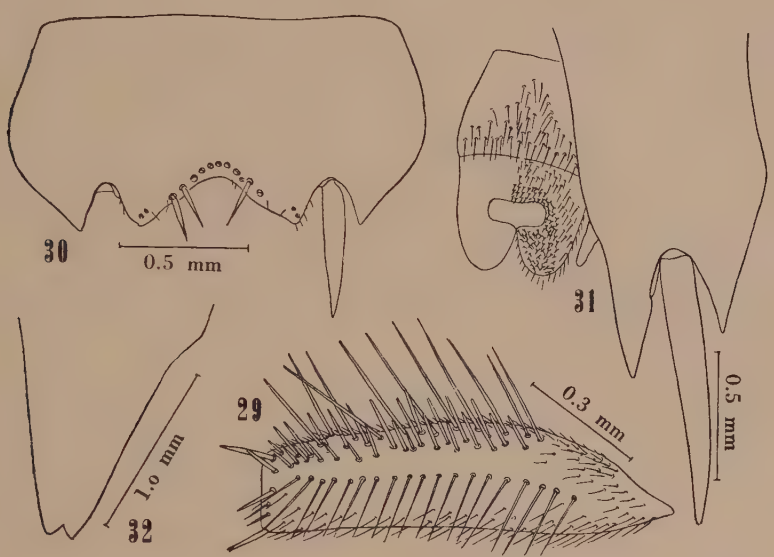
Labial palp as in fig. 22, apical segment triangularly widened (probably more so in larger specimens), its anterior surface with several rows of sensory spines (fig. 23).

Legs as in preceding species.

Urosternites and stylets as in generic description and figs. 24–26 ; relation of length stylet : coxite on segments II–VII = 0·45, VIII = 0·6, IX = 0·55.

Penis as shown in figs. 26 and 27, its opening occupying almost the whole length of upper surface of apical portion, surrounded by numerous groups and fields of specialised bristles.

Holotype male, São Tomé : Pico de São Tomé, 6700 ft., 11.ix.1949 (*G. R. Gradwell*). British Museum (Nat. Hist.) ; 1 male paratype in author's collection.



Figs. 29–32.—*Lepisma lusitana* Wygodzinsky, male allotype. (29) tibia of third pair of legs ; (30) urosternite VIII ; (31) coxite IX with penis ; (32) tenth tergite. Wygodzinsky del.

This species which is named after its collector, is based upon specimens which might not have attained their maximum size. It is possible that certain characters, such as the shape of the last segment of the labial palp, might be slightly modified in larger specimens. The well-developed chaetotaxy of the penis seems to indicate, however, that these are at least physiologically mature specimens, and as there are several characters which show them to be clearly different from the sympatric *snowi*, I have not hesitated to describe them as new.

Lepismatidae.

Lepisma lusitana Wygodzinsky, 1945.

Material examined : 1 male allotype[2], French Morocco : Volubilis, house, 17.vii.1952. In British Museum (Nat. Hist.).

The species was described from a single female collected at Cascais, near

Lisbon, Portugal. It has been shown before (Wygodzinsky, 1945) that there are various species of Lepismatidae common to Portugal and North Africa.

The present male (size 8 mm.) is very similar to the female in most respects. The tibia of the hind legs is figured (fig. 29) to show its peculiar chaetotaxy, viz., the long and short rather slender spine-like bristles of the ventral surface and the single row of long straight hairs along its side. The eighth and ninth sternites are also figured (figs. 30, 31); the seventh resembles that of the female. The penis is large, the parameres very small (fig. 31). The last tergite (fig. 32) is somewhat more elongate than in the type female, and its apical incision not quite as wide.

Lepisma saccharina L., 1758.

Material examined: 1 female, Sikkim: Lachen, 8950 ft., on inside bungalow wall (*T. Clay*). In British Museum (Nat. Hist.).

This and the following are very widely distributed species; the localities mentioned here are sufficiently interesting to warrant their enumeration.

Ctenolepisma longicaudata Escherich, 1905.

Material examined: 1 male, 1 female, India: Kangpokpi, Manipur State, bungalow, near fireplace, 3500 ft. (*T. Clay*): 1 female, Chungtang, Sikkim, 5120 ft., on bungalow wall, inside (*T. Clay*); 1 male, Lachen, Sikkim, 8950 ft., on inside bungalow wall (*T. Clay*). In British Museum (Nat. Hist.).

[2] This specimen was collected by J. Phillipson and C. Pollock on the Durham University French Moroccan Expedition of 1952, financed by the Durham College, the Royal Geographical Society and the University of Durham.

Résumé.

L'auteur décrit *Pseudomeinertellus* gen. n. avec le type, *snowi* sp. n. (femelle), *gradwelli* sp. n. (mâle) et *feae* (Silvestri) (femelle), tous de l'Ile São Tomé. Ce genre diffère de *Meinertellus* Silvestri par les soies du troisième article tarsale. L'allotype mâle de *Lepisma lusitana* Wygodzinsky est décrit du Maroc Français. Finalement il donne des localités nouvelles pour *Lepisma saccharina* L. et *Ctenolepisma longicaudata* Escherich, des hautes régions montagneuses du Nord de l'Inde.

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Wygodzinsky, P., 1945, Contribuição ao conhecimento dos Entotrophi e Thysanura de Portugal. III. Familia Lepismatidae (Thysanura). Conclusões. *Rev. brasil. Biol.* **5**: 419–433, 63 figs.

A NEW SPECIES OF *RAYMONDIA* FROM THE CAMEROONS (DIPTERA : STREBLIDAE).

By B. Jobling, F.R.E.S.
(*Wellcome Laboratories of Tropical Medicine.*)

The following description is based upon the examination of a single specimen sent to me by Dr. V. Aellen, of the Musée d'Histoire naturelle de Genève, which was collected by him during the Swiss Scientific Expedition to the Cameroons. I take this opportunity to express my thanks to Dr. Aellen for permitting me to describe his specimen.

Although the specimen has lost many setae on the dorsal surface of the thorax and the abdomen, its main characters are quite distinct. As regards the missing setae, it should be mentioned here that in many Streblidae their structure and position can be determined by the size and the position of their thecae.

In my key to the African species of *Raymondia* (Jobling, 1939) the new species runs to *R. alulata* Speiser (1908), which it resembles in its general appearance, in the presence of the transverse row of small setae on the occiput near the postero-dorsal margin of the head, and in the structure of the alula of the wings. It differs from Speiser's species in the form of the head, the angular posterior margin of the scutellum, the curved distal part of the second longitudinal vein, and in the presence of a brush-like patch of darkly pigmented setae in the postero-ventral part of the abdomen under the proctiger.

Raymondia scopigera sp. n.

Body 1·7 mm. long (on slide). Head narrower than anterior margin of thorax, more or less rounded laterally and slightly convex dorsally ; lateroverticesand ventral surface have the same chaetotaxy as those of *R. alulata*, but occiput bears thirteen setae in the transverse row, instead of eight or nine. Pedicel (second antennal segment) with two dorsal setae ; arista short, thick, with many very thin sensillae. Palpi as long as broad, with one long and a few shorter setae on anterior margin, their ventral surface bears small setae arranged in diagonal rows. Both antennae and palpi resemble those of *R. alulata*. Theca of labium indistinct owing to its vertical position in the preparation.

Thorax slightly broader than long. Mesonotum 0·5 mm. long. Humeral calli conical ; prescutum and scutum have the same chaetotaxy as those of *R. alulata* ; posterior margin of scutellum broadly angular, with a small protuberance in the middle ; posterior parts of thoracic squamae (ts) with a knob-like projection. Ventral surfaces of the thorax as in *R. alulata*.

Wings 1·5 mm. long. Distal part of second longitudinal vein bent towards anterior margin of wing ; third and fourth longitudinal veins parallel near wing margin ; subcostal cell with a few scattered setae ; marginal cell with many setae in the distal part ; submarginal cells with a few setae.

Abdomen : Each part of seventh tergite (7t) distinct, with three strong setae ; seventh sternite absent ; eighth sternite (8s) small, strongly sclerotised and without setae ; postero-ventral part of abdomen with a brush-like patch of darkly pigmented setae, which arise

from the large and closely situated thecae (Fig. C). Proctiger small, subconical, and strongly sclerotized, so that tenth tergite (10t), subanal plate (sp) and cerci (c) are quite distinct. Tenth tergite with two dorsal, two lateral and two ventral strong setae.

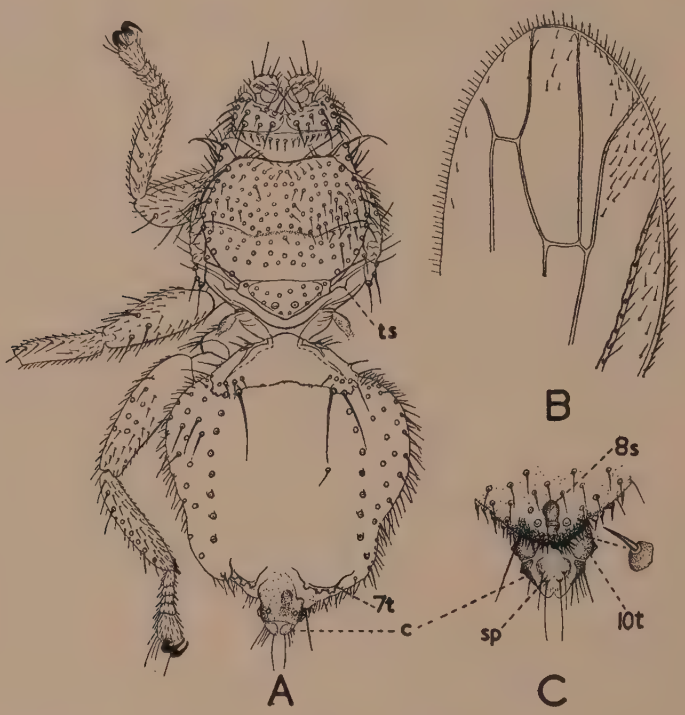

FIG. 1.—*Raymondia scopigera* sp. n. A, dorsal view of female; B, distal part of wing; C, posterior end of abdomen, ventral view, higher magnification. c, cerci; ts, thoracic squama; 7t, part of seventh tergite; 8s, eighth sternite; 10t, tenth tergite.

Type female, CAMEROONS: Ngaouyanga, from *Nycteris aethiopica aethiopica* Dobson, No. 1045, 19.vii.1947. The type is preserved in the private collection of Dr. V. Aellen.

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THE MALLOPHAGA FROM *EUDYPTES CHRYSOLOPHUS* (BRAND) AND *E. CRISTATUS* (MILLER).

By S. von Kéler

(*Berlin*).

This note is based mainly on material collected by the Australian National Antarctic Research Expedition and loaned to me by the British Museum (Natural History).

Two species of Mallophaga known from *Eudyptes cristatus* have hitherto been known, namely *Austrogoniodes hamiltoni* Harr. and *A. macquariensis* Harr., no positive record being known from *E. chrysolophus*.

Clay and Rothschild (1938) have recorded *A. strutheus* Harr. from captive specimens of *Eudyptes chrysolophus* and *E. cristatus*, but these records are probably due to contamination. I have not seen specimens from the first-named bird, but Miss T. Clay was kind enough to send me specimens collected in March, 1937, in the London Zoo from *Eudyptes cristatus* (two slides no. 8309, both undetermined), which proved to be conspecific with my *A. bifasciatus* ssp. *demersus* from *Spheniscus demersus*, Dyar's Isl., South Africa. They are also conspecific with a good series of specimens collected by Clay from captive individuals of *Spheniscus demersus*, and with a pair collected by Waterston from the same bird in South Africa.

A. strutheus was described by Harrison from *Eudyptes sclateri*, no locality. According to Thompson (cf. Guimarães, 1938), who has examined a specimen determined by Harrison as *A. strutheus*, this species is conspecific with *A. bifasciatus* (Piaget) from *Spheniscus magellanicus*. As I have not seen specimens of *A. strutheus* from one of the original hosts, I cannot decide whether this species is conspecific with *bifasciatus* or with ssp. *demersus*. It is at any rate certain, also from the original description, that the affinity of *A. strutheus* is near *Austrogoniodes bifasciatus* and its occurrence on *Eudyptes sclateri* and *schlegeli*, which are confined to the Islands south of New Zealand, is interesting, as has been already pointed out by Guimarães (*l.c.*).

Elsewhere (Kéler, 1952) two further species from *Eudyptes cristatus* are described, one of them being represented in the collection at hand, namely *Austrogoniodes cristati* from Tristan da Cunha.

We have then four species of Mallophaga known from *E. cristatus* and none from *E. chrysolophus*.

In the present material, collected by the A.N.A.R.E., there are represented the following species:

1. From *Eudyptes cristatus: Cesareus hamiltoni* (Harr.) (type host), and *Austrogoniodes cristati* Kéler (type host).

2. From *Eudyptes chrysolophus: Cesareus bicornutus* sp. n. (see below), *C. macquariensis* (Harr.) (new host) and *Austrogoniodes cristati* Kéler (new host).

Cesareus macquariensis (Harrison) (figs. 1–3).

Two males, four females and three nymphs from *Eudyptes chrysolophus* Rog., Heard Isl., S. Ind. Ocean, A.N.A.R.E. coll. no. 640, bird no. 631, 26.xii.1949. The specimens were collected off the head of the bird.

Fig. 1.—Map showing distribution of *Eudyptes cristatus* (subspp. *cristatus* and *filholi*) ———, *E. chrysolophus* – – – – and *E. schlegeli* · · · ·, after records in Peters (1931), Murphy (1936), Richdale (1941) and Serventy-Whittel (1948), comp. by Mr. Sanft, Ornith. Dep. Zool. Mus., Berlin.

Harrison (1937) described this species from two males and two females collected from *Eudyptes chrysocome* (= *cristatus filholi*) and *E. schlegeli*, both from Macquarie Isl. Later this species was recorded by Eichler (1941) from the original host (*Catarrhactes chrysocome* = *Eudyptes cristatus cristatus*) in Tierra del Fuego, collected by the Hamburger Magalhaens Expedition in 1893. This slide of the Hamburg Museum is before me. It contains one male of

C. macquariensis and three males and two females of *Austrogoniodes cristati* Kéler, one of the latter males having been figured by Eichler (*l.c.*) as "*macquariensis* Harr."

The occurrence of *C. macquariensis* on *Eudyptes chrysolophus* in Heard Island may easily be accounted for by the distribution of the penguin species in question, i.e., *Eudyptes cristatus cristatus*, *E. c. filholi* and *E. chrysolophus* (see fig. 1) and on the other hand by the contact which these birds may often have on their breeding places.

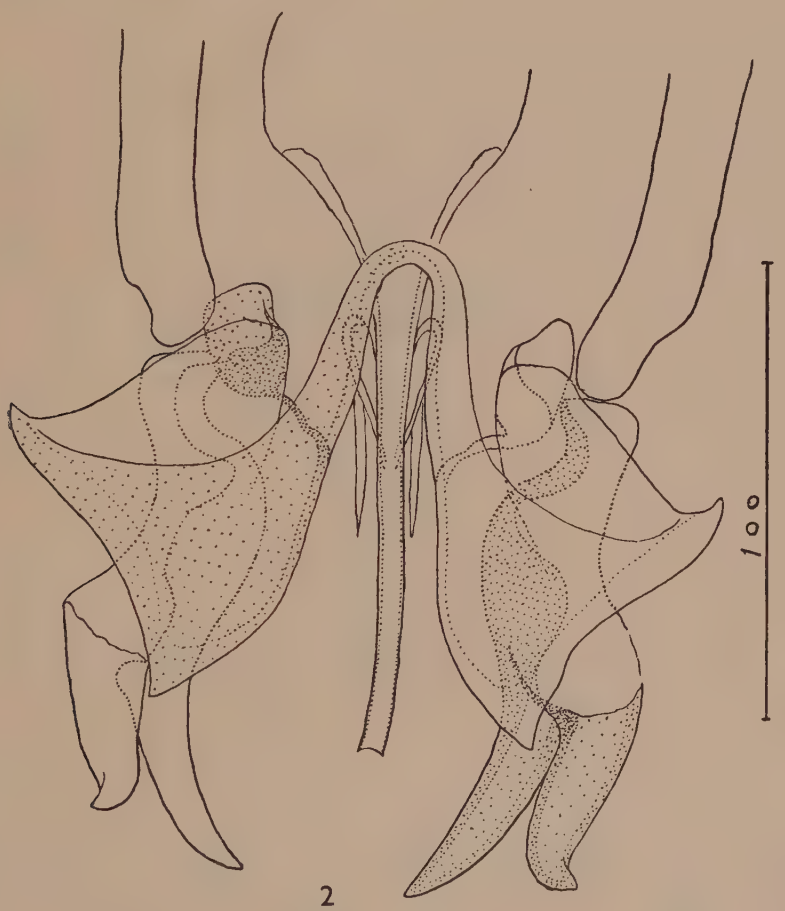

FIG. 2.—*Cesareus macquariensis* (Harr.), 1937. Posterior part of male genitalia. Specimen from *Eudyptes chrysolophus*, Heard Isl.

This case is similar to that of the occurrence of *Austrogoniodes bifasciatus* or *demersus* (*strutheus*, s.o.) on *Eudyptes sclateri* and *schlegeli* in the New Zealand area. In both cases we have evidence that Mallophaga can, in natural conditions, pass over from one host species to another and can survive on the new host; or alternatively we can accept the other opinion, namely that *C. mac-*

quariensis or *A. bifasciatus* (*demersus* resp.) remained unchanged when the original species of the host split into three different species.

C. macquariensis differs in many respects from the *bifasciatus*-group (*Austrogoniodes bifasciatus*, ssp. *demersus*; *A. cristati* may perhaps also prove to be a ssp. of *bifasciatus*) and is more closely related to forms of the *hamiltoni*-group, which I have placed in the genus *Cesareus*.

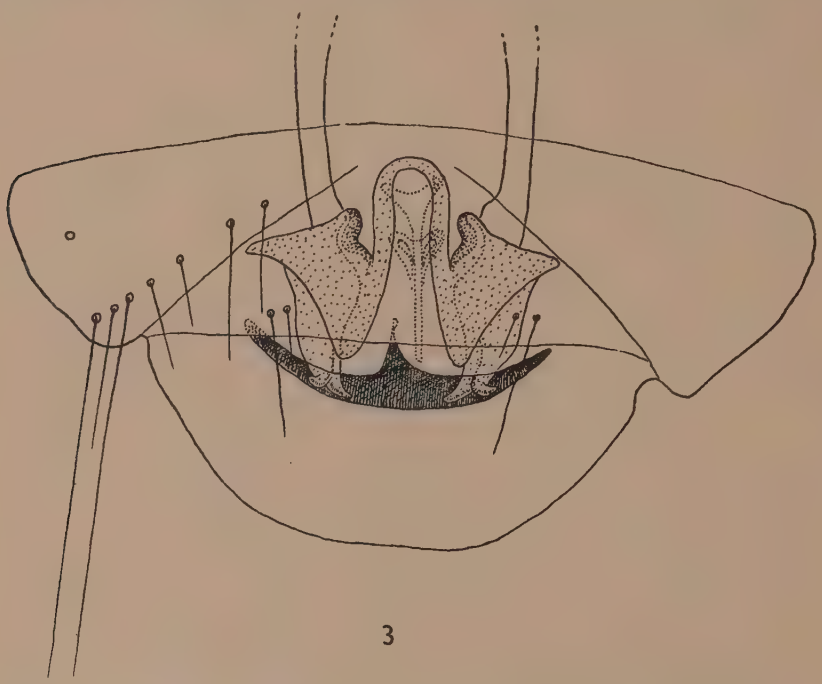

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FIG. 3.—*Cesareus macquariensis* (Harr.). Posterior part of male genitalia (*in situ*). Specimen from *Eudyptes cristatus cristatus*, Ushuaia, Tierra del Fuego.

*Measurements.**

	Males.				Females.				
	Harrison.	Ushuaia.	Heard Isl.		Harrison.	Heard Isl.			
HL^1	—	0·427	0·462	0·470	—	0·548	0·555	0·548	0·555
HL^2	0·386	0·370	0·400	0·400	0·420	0·470	0·476	0·470	0·483
HB	0·521	0·504	0·583	0·583	0·621	0·714	0·700	0·700	0·700
PB	0·201	0·217	0·300	0·294	0·285	0·357	0·350	0·364	0·364
MB	0·470	0·420	0·504	0·510	0·554	0·650	0·650	0·646	0·646
AB	0·688	0·590	0·742	0·728	0·789	1·050	0·950	0·980	0·960
TL.	1·386	1·288	1·547	1·555	1·738	1·974	1·960	1·980	2·023
I^1	—	1·18	1·26	1·24	—	1·30	1·26	1·28	1·26
I^2	1·35	1·36	1·46	1·46	1·48	1·52	1·47	1·50	1·45

* HL^1 = head length, with posttemporal projections, and (HL^2) in the mid-line, HB = head breadth, PB = prothorax breadth, MB = metathorax breadth, AB = abdomen breadth, TL = total length of the body, I^1 = head index for the first and I^2 = second length of the head.

The specimens from *E. chrysolophus* differ slightly in some measurements from the original description, as also from the male taken in Ushuaia. The latter is juvenile and besides it is mounted in canada balsam without having been treated in caustic potash, both facts being probably responsible for the differences. As the head index of *C. macquariensis*-males from *chrysolophus* is greater and that of the females agrees in the mean ($\pm$ 1·485) with that of the original description, it seems that the differences may be only individual, or partly due to differences in mounting.

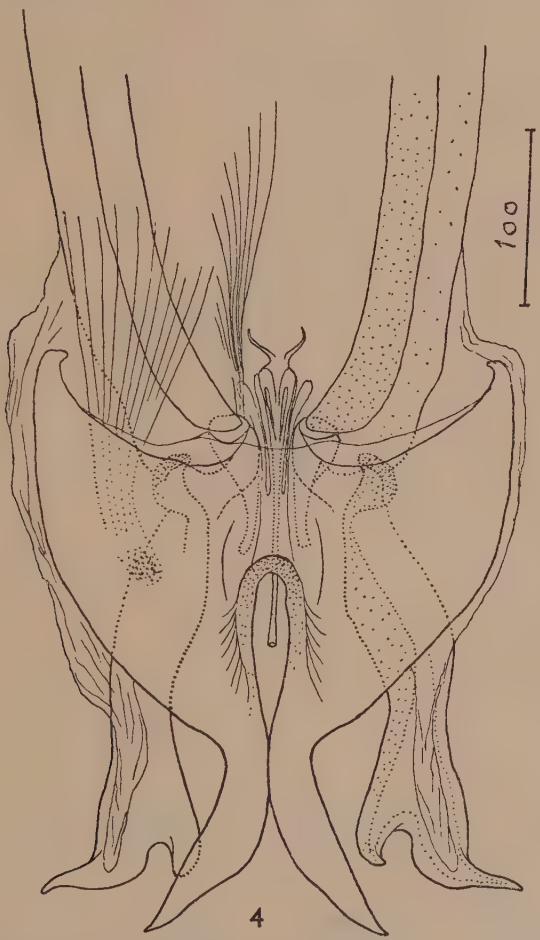

Fig. 4.—*Cesareus hamiltoni* (Harr.), 1937. Posterior part of male genitalia. Specimen from *Eudyptes cristatus filholi*, Macquarie Isl.

The male genitalia of my specimens from *E. chrysolophus* (fig. 2) are exactly as in the male from Ushuaia (fig. 3) except the small differences caused by the oblique position of the genital organ in the latter male.

I do not think, at present, that there are any subspecific differences between *C. macquariensis* from *Eudyptes chrysolophus* and *E. cristatus*, but a com-

parison of a longer series of specimens from both hosts and from *E. schlegeli* and *sclateri* may perhaps throw some new light on the systematics of this species.

As to the generic position of *C. macquariensis*, it may be noted that this species shows in both sexes a very distinct appendix coni on the end of the clavi, which is also present in *C. hamiltoni* and *C. bicornutus*, while it is wanting in the species of the *bifasciatus*-group. The antennae of *macquariensis* are

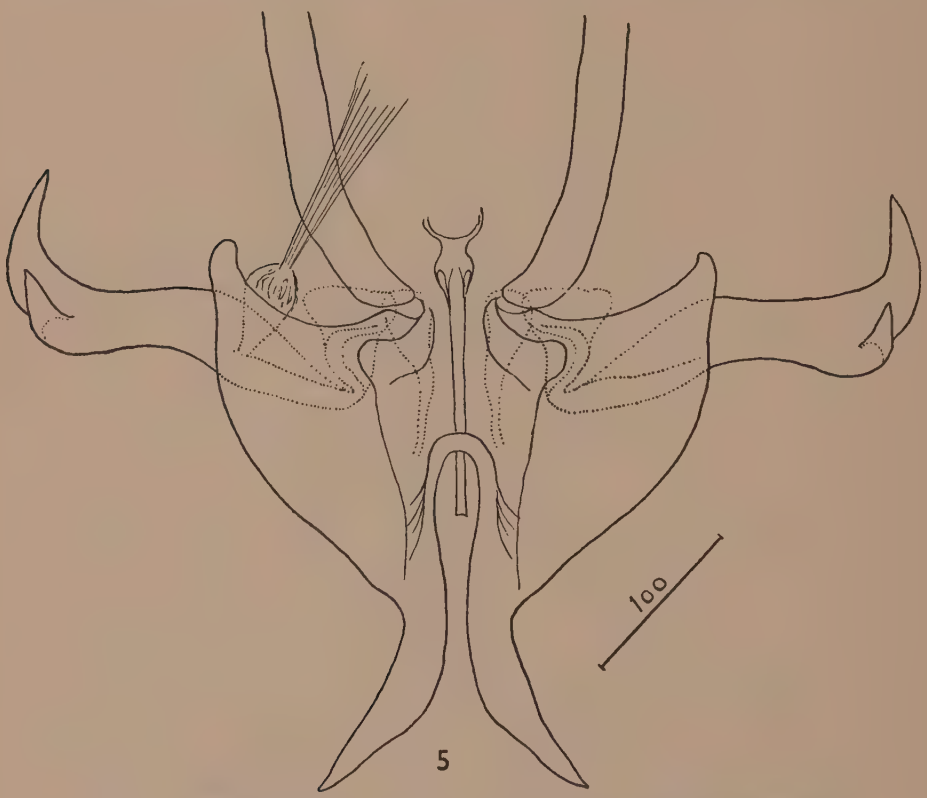

FIG. 5.—*Cesareus hamiltoni* (Harr.). As fig. 4, with spread out parameres. Male paratype, type no. 437 in British Museum.

distinctly dimorphic only in the basal segment and the temporal lobes are not so prominent as in *hamiltoni* and *bicornutus*, but much more prominent than in the *bifasciatus*-group. The lateral lobes of the metathorax are nearly as strongly dilated as in *hamiltoni* and *bicornutus*. Finally, the shape of the strongly dilated tibial spurs in *macquariensis* is as in *hamiltoni* and *bicornutus*.

Cesareus hamiltoni (Harrison) (figs. 4–7).

Material.—Seven males, 13 females and 6 nymphs from *Eudyptes cristatus* (juv.) Macquarie Isl., A.N.A.R.E. coll. no Mi/49/B.7, 9.vi.1949, and 2 females

from the same host species, Atlas Cove, Heard Isl., A.N.A.R.E. coll. no 443, bird no. 442, 30.xi.1949.

This species was described from many males and females by Harrison (1937) from *Eudyptes chrysocome* (= *E. cristatus filholi*) from Macquarie Isl. Clay (1940) recorded it from *E. c. cristatus*, Falkland Isl.

As the drawing of the copulatory apparatus in the original description shows a different shape of the tips of the parameres, it was necessary to compare the types of this species. Through the kindness of Miss Theresa Clay, British Museum (Natural History), I have been able to compare a male and a female paratype of *C. hamiltoni*.

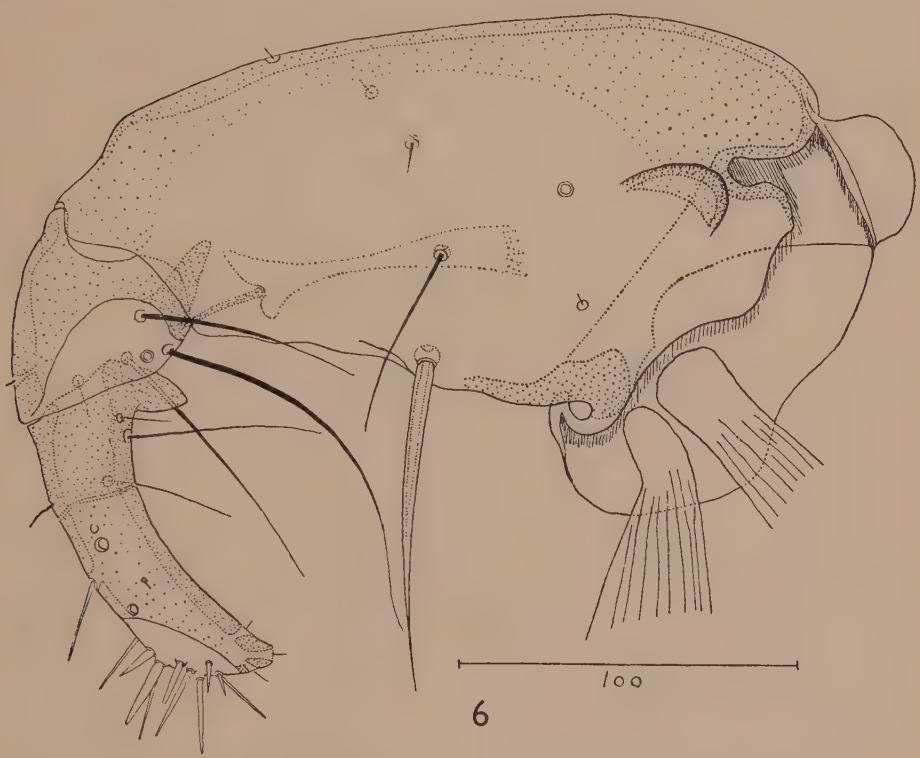

Fig. 6.—*Cesareus hamiltoni* (Harr.). Left antenna of male, dorsal aspect.

Figs. 4 and 5 in this paper show the copulatory organ of *C. hamiltoni*, A.N.A.R.E. coll., no. MI/49/B.7, and fig. 7 the ends of the parameres and endomeral plates of the paratype male.

If compared with the respective figure in the original description it must be stated that both the paramere teeth are not of equal length and are not both curved inwardly as in Harrison's drawing, but they are of unequal length and the outer tooth is strongly directed outwards, whereas the inner tooth is directed postero-medial as in my figures. The extreme tip of the inner tooth is in some specimens directed slightly outwards.

In fig. 5 the copulatory apparatus is shown in an early stage of erection, with the parameres stretched out and with both the parameral teeth directed outwardly, just as in Harrison's second drawing.

Assuming that the male, the genitalia of which have been drawn by Harrison, was conspecific with his paratypes, then the drawing of the parameral teeth in the original description is erroneous.

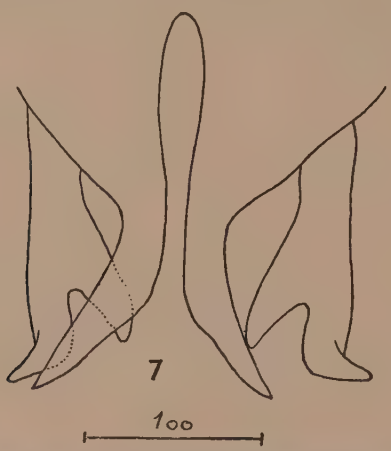

Fig. 7.—*Cesareus hamiltoni* (Harr.). Ends of parameres and endomer of a paratype male in British Museum (type no. 437).

Cesareus bicornutus sp. n. (figs. 8–9).

Material.—One male and two females from *Eudyptes chrysolophus*, Atlas Cove, Heard Isl., A.N.A.R.E. coll. no 628, bird no. 620, 26.xii.1949. Two males and three females from the same host species and locality, A.N.A.R.E. coll. no. B.M. 1951–252, 621 + 619, 26.xii.1949. One male, two females and three nymphs from the same host species, immature bird, no locality, A.N.A.R.E. coll. no. 673, 31.xii.1949.

Holotype: a male from bird no. 620, coll. no. 628, in the British Museum.

Allotype: a female from the same bird, on the same slide with the holotype.

Paratypes: two males and five females in the British Museum and one male and one female in the Zoological Museum, Berlin. The nymphs have not been regarded as paratypes, as there are but three very young ones and I am not sure enough whether they belong to this species or perhaps to *Cesareus macquariensis*, from which I have but 3 nymphs of an early stage.

Males and females in length, habitus and chaetotaxy very similar to *hamiltoni* Harr. In the male the clypeal region is more flatly rounded than in *hamiltoni* (0·400–0·413 : 0·063–0·070 = 6 : 1 in, *hamiltoni* 0·400 : 0·050 = 8 : 1). Genital organ as in fig. 8. Last segment nearly regularly rounded, semicircular (in males of *hamiltoni* it is more parabolic), with distinctly flattened sides.

The females are practically indistinguishable from *hamiltoni*; being separated only by the pair of brown chitinised tubercle-like structures just behind the lateral pouches of the vaginal sac, which are wanting in all my females of *hamiltoni*.

Measurements.

	Males.			Females.						
		Holo-type.							Allo-type.	
HL^1 .	0·511	0·497	0·504	0·576	0·562	0·525	0·525	0·525	0·540	0·520
HL^2 .	0·406	0·392	0·400	0·497	0·483	0·462	0·462	0·448	0·462	0·455
HB .	0·680	0·650	0·658	0·728	0·700	0·640	0·646	0·658	0·632	0·625
PB .	0·378	0·357	0·343	0·370	0·350	0·294	0·310	0·294	0·310	0·310
MB .	0·658	0·632	0·632	0·675	0·650	0·590	0·590	0·576	0·576	0·583
AB .	0·980	0·910	0·882	1·010	0·910	0·910	0·896	0·896	0·940	0·952
TL .	1·975	1·904	1·764	2·072	1·960	1·750	1·792	1·778	1·862	1·820
I^1 .	1·35	1·31	1·30	1·26	1·24	1·22	1·22	1·23	1·17	1·25
I^2 .	1·67	1·61	1·64	1·46	1·43	1·43	1·43	1·49	1·37	1·37

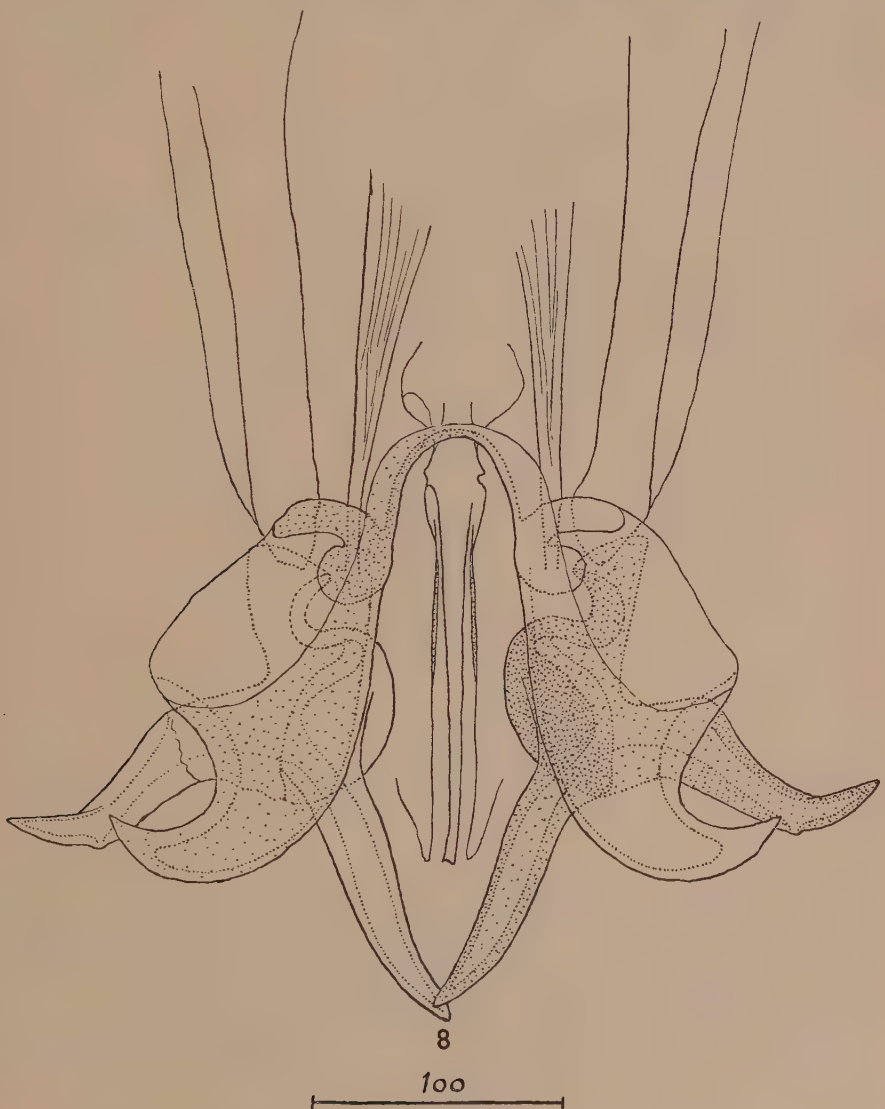

FIG. 8.—*Cesareus bicornutus* sp. n. Posterior part of male genitalia.

Austrogoniodes cristati Kéler.

Material.—Two males and three females from *Eudyptes chrysolophus*, Heard Isl., S. Ind. Oc., A.N.A.R.E. coll., no 641, bird no 631 (head), 26.xii.1949. One male from the same host species and locality, A.N.A.R.E. coll. no. 628, bird no. 620, 26.xii.1949. Two males and one female from the same host species and locality, A.N.A.R.E. coll., B.M. 1951—252, 621 + 619, 26.xii.1949.

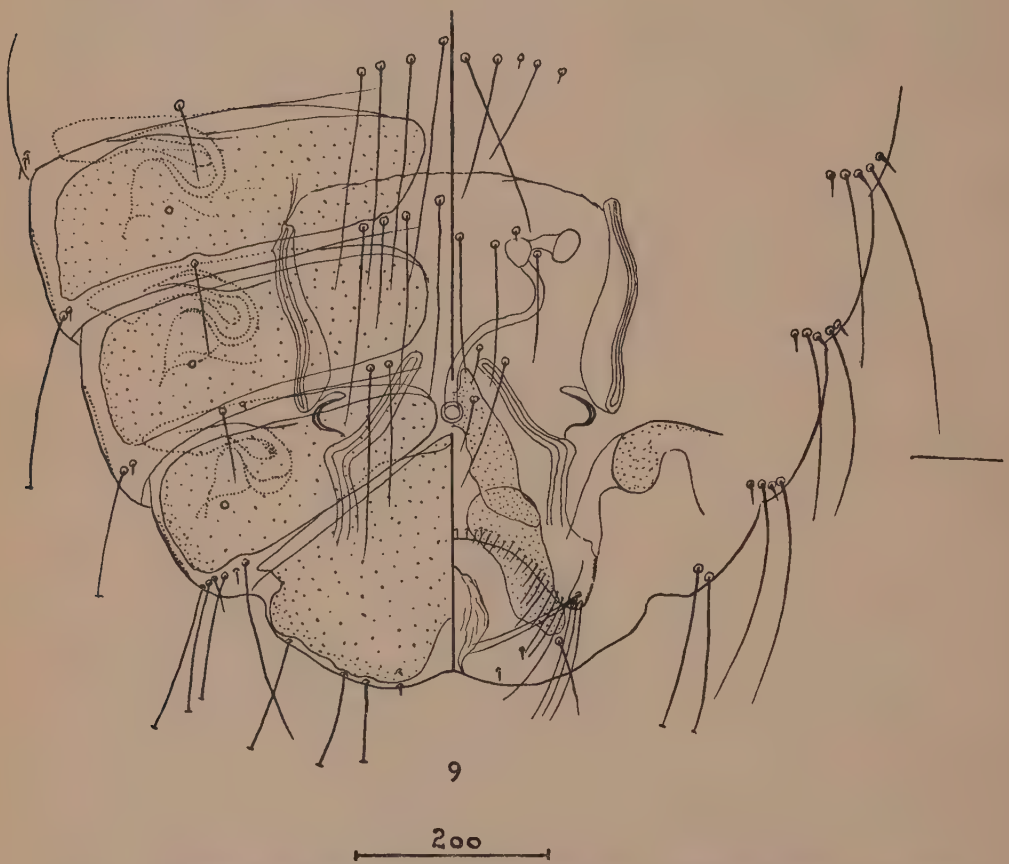

Fig. 9.—*Cesareus bicornutus* sp. n. Posterior segments of abdomen (apex) of female. Left dorsal, right ventral side.

Four males and five females from *Eudyptes cristatus*, same locality, A.N.A.R.E. coll. no. 443, bird no 442, 30.xi.1949. Four males and three females from the same host species, Macquarie Isl., A.N.A.R.E. coll. no Mi/49 B.7, 9.vi.1949.

Some of the specimens of the above series from *E. chrysolophus* were used in the original description, and are labelled as paratypes.

There is at present nothing to be added to the original description of this species.

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TWO NEW SPECIES OF ISOTOMIDAE (COLLEMBOLA) FROM EAST AFRICA.

By J. T. Salmon, D.Sc., F.R.S.N.Z., F.R.E.S.

(Victoria University College, Wellington, New Zealand.)

This is the second of a series of papers dealing with the collections of Collembola made in East Africa during January and February, 1949, by Dr. George Salt of Cambridge University. In addition to recording the occurrence of *Isotomiella minor* Sch. from Mt. Baker, Uganda, in a soil sample at 14,200 ft., two new species of Proisotominae are described.

Parafolsomia Salmon, 1949.

Parafolsomia africana sp. n. (figs. 1–10).

Colour : Brownish black dorsally and laterally ; pale fawn ventrally, and on legs and furcula ; antennae greyish black ; intersegmental margins pale ; each ocellus situated on its own individual black pigment spot.

Clothing : Of short to medium simple setae ; the characteristic transverse segmental bands of setae typical of *Parafolsomia* occur around the posterior borders of the head, the thoracic and first three abdominal segments ; some of the longer setae around the posterior of the body each have a pair of opposite spines about one third from base ; abd. I–V each with a single erect dorsal seta about centre of each segment.

Body : Length up to 2·25 mm. Antennae about twice length of head, the four segments related as 15 : 24 : 21 : 42. Ant. IV with apical sensory dome and numerous simple setae interspersed with long slender sense rods (the latter distinguished by their truncated apex) ; sense organ ant. III subapical, with two stout sense rods behind an integumentary fold which may lie almost flat or considerably bent out, as shown in fig. 9. Postantennal organ variable, normally elliptical and constricted at centre to the extent, sometimes, of being almost cut into two (figs. 5–8), twice as long as adjacent ocellus. Rami of tenaculum each with four teeth (fig. 2). Abd. IV longer than Abd. III, as 60 : 48.

Legs : Claw (fig. 1) without any teeth but with prominent, raised, basal inner margin. Unguiculus about half length of inner margin of claw, with very broad inner lamella to three-quarters down and broad outer lamella to apex. A single clavate tenent hair, shorter than claw, to each foot.

Furcula : Manubrium to dens to mucro as 40 : 43 : 7 ; manubrial hooks present. Anterior face of dens with some irregular corrugations along central portion and 5–6 short

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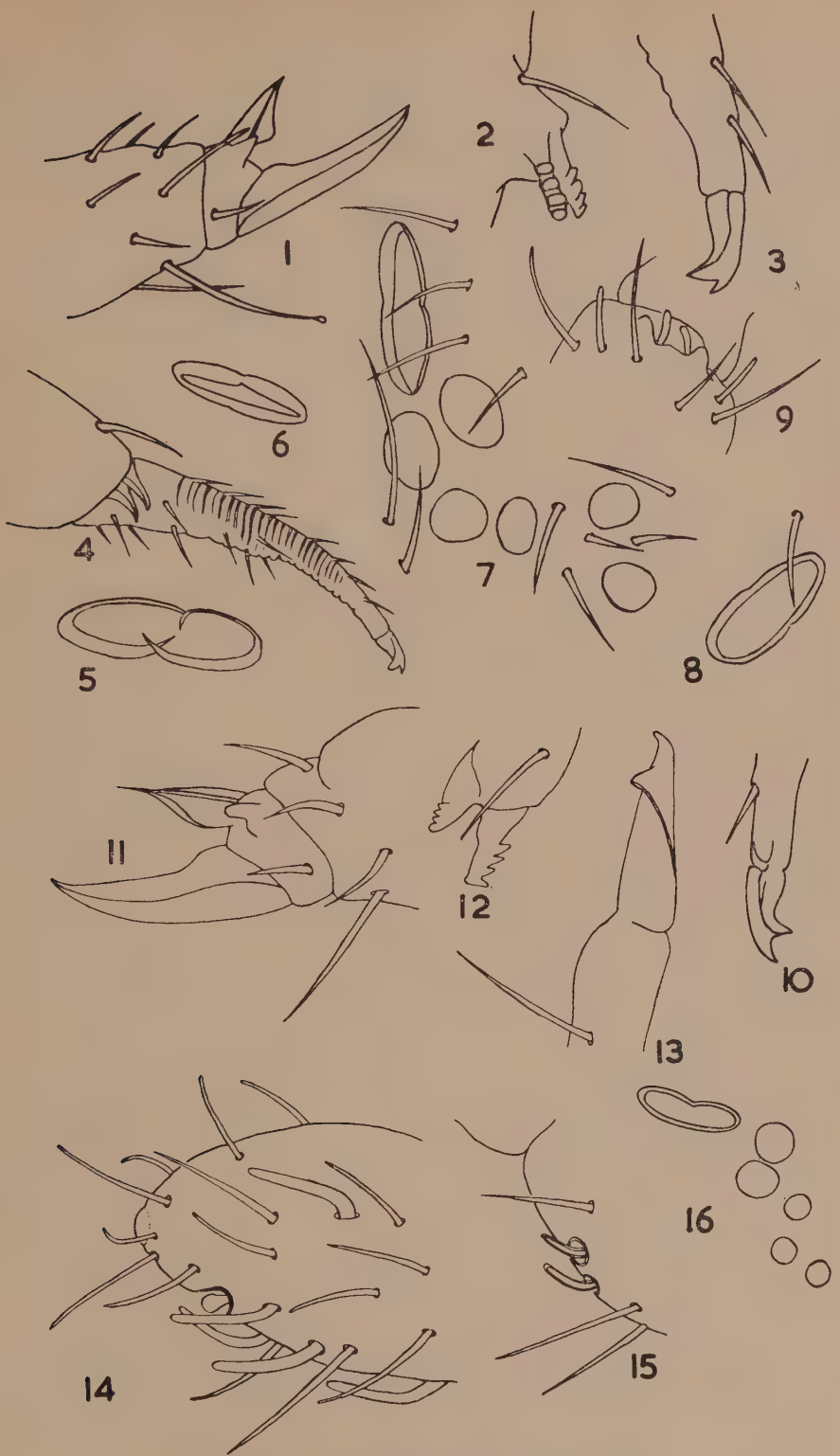
Figs. 1–10.—*Parafolsomia africana* sp. n. (1) Hind foot. (2) Tenaculum. (3) Mucro and apex of dens. (4) Dens and mucro with apex of manubrium. (5) Postantennal organ of a paratype. (6) Postantennal organ of another paratype. (7) Ocelli and postantennal organ of left side of type. (8) Postantennal organ of another paratype. (9) Sense organ ant. III. (10) Mucro and apex of dens of smaller paratype specimen.

Figs. 11–16.—*Proisotoma quinocellata* sp. n. (11) Hind foot. (12) Tenaculum. (13) Mucro and apex of dens. (14) Apex of ant. IV. (15) Sense organ ant. III. (16) Ocelli and postantennal organ of left side.

Scale : At the microscope, fig. 4, × 240 ; fig. 9, × 700 ; figs. 1–3, 5–8 and 10, all × 560 ; figs. 11–16 all × 1260.



Figs. 1–16. For explanation see opposite page.

slender setae, posterior face with many setae (fig. 4). Mucro-dens joint distinct, but incomplete ; mucro bidentate, elongate with apical and very large subapical teeth ; the relative sizes of these two teeth varies with the size of the specimen ; in smaller specimens the teeth approximate one another in size, see figs. 3 and 10.

Holotype in the British Museum (Natural History) from Uganda : Ruwenzori, Mt. Baker, in soil sample at 15,250 ft.

Paratypes in the British Museum (Natural History), Museum Comparative Zoology, Harvard, U.S.A., and in author's collection from the same locality as the holotype, from Mr. Baker at 14,200 ft., from Ruwenzori, Mt. Speke, in soil sample at 15,500 ft. and from Kilimandjaro, Schira Plateau, in soil samples at 14,500 and 15,000 ft.

Proisotoma Börner, 1901.

Proisotoma quinocellata sp. n. (figs. 11–16).

Colour : Medium to dark reddish or purplish brown on head and body, with intersegmental margins pale yellow ; antennae, legs and furcula paler yellowish brown ; ocellar fields black but rather indefinitely outlined.

Clothing : Moderately well clothed with medium length simple setae.

Body : Length up to 1 mm. Antennae and head subequal in length, the four antennal segments related as 11 : 15 : 15 : 25. Ant. IV with a large sub-apical sense club in a cuticular depression and, on the opposite side to this, a short curved sub-apical sense rod, 7–8 long stout bent sense rods, numerous shorter, curved, more slender sense rods and clothing of many simple setae (fig. 14) ; ant. III subapically with two long, curved, exposed sense rods side by side. Ocelli five to each side, subequal ; postantennal organ elliptical ; three times as long as broad and three times as long as the diameter of the adjacent ocellus (fig. 16). Abd. IV longer than abd. III as 48 : 38. Rami of tenaculum each with four barbs, corpus with a long basal seta (fig. 12). Genital aperture on abd. V with two surrounding circles of setae, the outer circle containing ten setae, the inner six shorter setae.

Legs : Claw finely granulate without any teeth, but with long basal seta to each side ; unguiculus with needle-like apex, two broad inner lamellae and single narrower outer lamella (fig. 11). Tenent hairs absent.

Furcula : Manubrium to mucrodens as 30 : 28 (mucro 10 : dens 18) ; mucro-dens joint indistinct ; dens with three setae on posterior face ; mucro finely granulate, bidentate, the pre-apical tooth lateral, much larger than the apical, with a lamella extending across to opposite side of mucro (fig. 13).

Uganda : Ruwenzori above Lake Bujuka, under moss on stones 12,750 ft.

Holotype and Paratypes in British Museum (Natural History) ; paratypes in author's collection and Museum of Comparative Zoology, Harvard, U.S.A.

Remarks : This species is nearest related to *P. rickardi* Denis, 1924, from Monaco.

ON TWO SPECIES OF ANASPIDINAE (COLEOPTERA : SCRAPTIIDAE) TAKEN ON FLOWERS OF *PROTEA ABYSSINICA* IN NATAL.

(XXVIII. Contribution to the knowledge of Mordellidae and Scraptiidae.[1])

By Mario E. Franciscolo, D.Sc., F.R.E.S.
(*Genoa, Italy.*)

Mr. J. Balfour-Browne of the British Museum (Natural History) has kindly submitted to me for indentification 44 specimens of Anaspidinae collected in the Drakensberg Mountains, Natal, on flowers of *Protea abyssinica*, which include two new species, one belonging to *Akentra* gen. n. (42 specimens) and the other to *Anaspis* subgen. *Spanisa* Emery (2 specimens).

The new genus *Akentra* seems to be strictly localised to Natal. The subgenus *Spanisa* Emery included hitherto only three Mediterranean species (*aharoni* Reitter, *labiata* Costa, and *subtilis* Hampe ; *rufitarsis* Schilsky having been transferred to *Larisia* by Ermisch (1949–50 : 91). The discovery of a fourth species in South Africa, which fully agrees with the subgeneric characters given by Emery (1876 : 13) for the sub-genotype (*Spanisa labiata*), is therefore very interesting.

Unfortunately very little is known at present regarding the plants with which the larval stages of *Spanisa* are associated in Southern Europe. It may, however, be pointed out that *Spanisa*, like other *Anaspis* s.l. and other genera of Anaspidinae, may be found in temperate S. Europe on a wide range of plants, although it is probable that in the larval stages it is specifically associated with definite species or groups of plant species. If the same occurs, as is likely, in South Africa and other regions it is not possible to affirm that this new *Spanisa* is definitely associated with *Protea* flowers, or with some of their stages, until information is available on the larval stages. The same factors apply to *Akentra*, which, like all other Anaspidinae, has typical nectar feeding habits and may therefore be easily found, in the imaginal stage, on various plants, depending upon the degree of maturation of their flowers.

I take pleasure in naming the new species of *Akentra* after Mr. J. Balfour-Browne, who kindly submitted the specimens for identification.

I find it advisable to anticipate and extract from my work in course of preparation for the *Durban Museum Novitates* the following key to the Anaspidinae, which includes also the recently described genera *Striganaspis* Ermisch, *Striganaspella* Ermisch and *Anaspimorda* Ermisch, and in which I have changed Ermisch's interpretation of the position of *Cyrtanaspis* Emery (1876 : 47). The position of *Akentra* is also established in this key :

1 (10) Antennae with first two segments of normal size and form ; segments dilating slightly sometimes from the 5th, sometimes

[1] Anaspidinae have until now been included in the Mordellidae. Many morphologists, however, are inclined to transfer them to another family of Heteromera ; I wish therefore to point out that I am in full agreement with the views of R. A. Crowson (1953 : 56, 57) in considering Anaspidinae as a subfamily of Scraptiidae.

from 8th, and all segments rather unequal in size, with a tendency to shorten and broaden from 4th or 5th to 10th. Middle tibiae with no longitudinal ridge on dorso-lateral side.

2 (3) Fourth segment of anterior and middle tarsi as large as or a little smaller than third, its anterior margin being emarginate or bilobed ; third segment not broadened, and always transversely truncate at its apex . . . . . **Pentariini trib. n.** (*Diclidia* Lec., *Naucles* Champ., *Pentaria* Muls., *Anaspella* Schilsky, *Striganaspella* Ermisch)

3 (2) Fourth segment of anterior and middle tarsi extremely small, feebly visible, and lying entirely in the excavated front margin of third segment, which is always broadened, and deeply bilobed ; small fourth segment always transversely truncate at its apex . . . . . **Anaspidini** Kuhnt, 1912

4 (7) Segments of hind tarsi (usually 1st to 3rd and, in some instances, also of hind tibiae) with a very fine but distinct thin longitudinal ridge, which, in the majority of cases, runs from base to apex of each segment ; these ridges may be entirely straight, running on the dorsum of the segment, or slightly sinuous, starting from the ventral side near the base and reaching apical margin near dorsal side. Hind tibiae may be transversely or obliquely truncate at apex ; in the latter instance the tarsi are apically transversely truncate.

5 (6) Hind tibiae apically obliquely truncate, but still with a wide angle, and without any ridge on dorso-lateral side ; each segment of hind tarsi distinctly transversely truncate at apex, and segments 1 to 3 with a sinuous, slender and spinulate lateral ridge starting near the base at the level of the under side and reaching the apex near the dorsal side. As shown in the figure given by Ermisch (1950 : 88) 1st and 2nd segments of front tarsi are triangularly excised at apex. Hind tibiae as long as or a little longer than 1st tarsal segment . **Striganaspis** Ermisch

6 (5) Hind tibiae transversely truncate (fig. 5 (1)) and with a fine but very distinct ridge starting on the lower side near the base, crossing tibial surface and terminating near the apex, at half of width of tibia ; hind tarsi with one thin, straight ridge on segments 1 to 3, which is parallel and close to their dorsal margin ; front tarsi have 1st and 2nd segments quite transversely truncate ; hind tibiae as long as the 1st and 2nd tarsal segments taken together[2] . . . . . **Cyrtanaspis** Emery

7 (4) Hind tarsi and tibiae quite without ridges ; sometimes with isolated spurs or spinulae on outer side of each segment. Apical margin of hind tibiae and of each hind tarsal segments 1–3 always very obliquely truncate, sometimes with an extremely sharp angle (fig. 5 (2–9)).

8 (9) Hind tibiae and tarsal segments 1–3 always very obliquely truncate at apex but the terminal ridge keeping close to the apex of the segments fully across the truncature and therefore lying close to tibial spurs ; ridge never attaining as far as middle of ventral face of segments (figs. 5 (2–7*a*)). Male normally

[2] Previous workers have apparently overlooked the presence of a dorsal ridge on hind tibiae and tarsal segments 1–3 in *Cyrtanaspis* ; I find no mention of it in the works of Emery (1876) and Ermisch (1949–50 ; 1950).

with appendages on last 2 or 3 abdominal segments ; if not, last two segments appear more or less impressed or emarginate **Anaspis** Geoffroy (s.l.)

9 (8) Hind tibiae (figs. 5 (8–9)) with an extremely oblique terminal ridge which does not keep close to apex across the truncature but turns basally and leaves base of tibial spurs widely exposed, attaining nearly to middle of ventral face of tibia ; tarsal segments 1–3 similar, the terminal ridge rarely extending as far as middle of ventral face, usually only to two-thirds from base. Males without appendages on last 2 or 3 abdominal segments, but the last two segments always excavate, impressed or emarginate. . . . . **Akentra** gen. n.

10 (1) Antennae with first two segments extremely small, one and a quarter times as long as wide ; from third to tenth twice as wide and as long as the first two taken together, cylindrical, all of even size and length, 11 subclavate, as wide as preceding ones ; middle tibiae with one dorso-lateral, straight, linear ridge, running from base to apex. Hind tibiae with the same type of ridge . . . . . **Anaspimordini trib. n.** (*Anaspimorda* Ermisch)

While no detailed description of the genus *Anaspimorda* has been available to me, it seems to have some features, mainly in the structure of the front tarsi, which may make it desirable to remove it from the Anaspidinae ; a detailed study of the genital apparatus and of the mouth-parts, when possible, will settle this point. It can, however, now be stated that *Anaspimorda* (1950 : 89–91, figs. 22–23) is certainly an extremely aberrant form, which on certain characters could be supposed a Melandryid ; nevertheless, I do not consider it a Melandryid.

The three species now referable to *Akentra* may be distinguished according to the following key. I select as type of *Akentra*, *A. balfour-brownei* sp. n.

1 (2) Body entirely black or piceous black, without paler markings on elytra ; base of antennae, mouth-parts reddish-brown ; front and middle legs piceous-brown ; spurs of hind tibiae testaceous. Hind tibiae rather slender, little wider at apex than at base ; the oblique subapical ridge reaches, ventrally, about one-third of ventral length of tibia (fig. 2 (1–2)) ; maxillary palpus of male with last segment widely securiform (fig. 2 (9)) ; 5th sternite of abdomen of male rather narrow, semicircularly emarginate at apex, and impressed behind the emargination ; 6th sternite with a deep and wide longitudinal impression at middle, shortly and triangularly incised at tip (fig. 2 (5)) ; proportions of hind tarsal segments 19 : 11 : 10 : 9. Length : max. 2·25 mm., min. 1·85 mm. (Drakensberg) . . . . . **balfour-brownei** sp. n.

2 (1) Body red-yellow ; a black margin on base of elytra, continued up to the middle on suture and extending a short way on humeral side, one quadrate spot on each elytron, at middle, starting from epipleurae and attaining almost to suture but without touching it. Hind tibiae stout, widely dilated at apex ; apical ridge reaches, and even surpasses ventrally middle of tibia (fig. 5 (8, 8*a*, 9)).

3 (4) Average length 2 mm.; apex of 5th sternite very shortly and feebly emarginate in male; 6th sternite not emarginate; maxillary palps of male with last segment narrowly securiform, twice as long as wide; hind tibiae with apical ridge attaining ventral side at about one quarter of their length (fig. 5 (8, 8*a*)) from base; first and second segments of front tarsi narrower than the third, which in the male is widely dilated. Antennae with 4th segment in male and female shorter than 3rd, 5th segment of same size as 4th. Ratio of hind tarsal segments: 18 : 12 : 11 : 13 (Natal) . . . . . **inoptata** sp. n.

4 (3) Average length of male about 2·35 mm.; apex of 5th sternite of abdomen deeply and triangularly emarginate, 6th sternite not emarginate, but truncate at apex; maxillary palpus of male with last segment very broadly securiform, one and one-fifth times longer than wide; apical ridge of hind tibiae extremely oblique (fig. 5 (9)) but attaining ventrally middle of tibia. Antennae with segments 2–4 very slender, 3 times as long as wide, subequal in length; 5th segment about one-third shorter than 4th. Ratio of hind tarsal segments: 24 : 13 : 15 : 15 (Natal) . . . . . **basicornis** sp. n.

A complete description of *A. inoptata* and *A. basicornis* will be given in my paper on Mordellidae and Scraptiidae of the Durban Museum (1954, in *preparation*).

Akentra balfour-brownei sp. n. (Fig. 1.)

Length (mm.): head max. 0·45, min. 0·3; pronotum max. 0·4, min. 0·35; elytra max. 1·3, min. 1·2; total max. 2·25, min. 1·85.

Width (mm.): head max. 0·5, min. 0·4; pronotum max. 0·65, min. 0·55; elytra max. 0·65, min. 0·55.

Ground-colour of body entirely black; segments 1–5 of antennae, labial and maxillary palpi, other mouth-parts, labium and anteclypeus reddish-brown; front and middle tibiae and tarsi piceous-brown; spurs of hind tibiae testaceous; hind legs more often brown-black.

Form as in fig. 1; seen from one side, it appears regularly arcuate (fig. 2 (11)).

The pubescence sparse, transversely distributed on prothorax and elytra, of a pale blond colour, giving a shining appearance to the insect.

Head with a series of punctures, in which the hairs of the pubescence are inserted, distributed in a circle around the disc; punctural interstices rather granulose; head as in fig. 1; seen from the side, it appears rather convex; antennae, palpi, maxillae and labium as in fig. 2 (7–9, 10, 12, 13, 14), eyes subelliptical, deeply emarginate anteriorly, very coarsely granulate, entirely reaching occiput, not pubescent.

Pronotum (fig. 1) subtrapezoidal; its surface coarsely and transversely strigose, interspaces between strigae glossy, not granulate; sides, seen laterally, appear straight; front angles almost square, basal ones slightly acute, rounded at apex; base almost without lobe.

Scutellum small, triangular, broadly sculptured.

Elytra with a series of transverse strigae, rather widely placed; interspaces between them appear glossy, not granulate; sides, seen laterally (fig. 2 (11)), appear regularly arcuate, epipleurae paler, not larger than one-third of metepisterna near shoulders; not visible beyond second abdominal segment. Elytra separately but abruptly rounded at apex.

Abdomen of six visible segments (see figs. 2 (5–6)); in male 5th segment semicircularly

emarginate at apex, at base of emargination a deep impression; 6th sternite subtriangularly and shortly incised at tip, and bears a longitudinal impression from middle to apex.

Front legs as in fig. 2 (3); middle legs as in fig. 2 (4); hind legs (fig. 2 (1–2)) of a brown-black colour, with testaceous tibial spurs; tibiae with apical ridge attaining ventrally about one-third of their length, leaving a shining, wide, free space without setae between the insertion of the spurs and the ventral margin; tarsal segments 1–3 also with a very oblique apical ridge, which attains the ventral face at two-thirds of the length of the segments.

Female differs from the male mainly in having less dilated front and middle tarsal segments and the abdomen with a wider and less convex 5th sternite, which is less emarginate and impressed than the 6th.

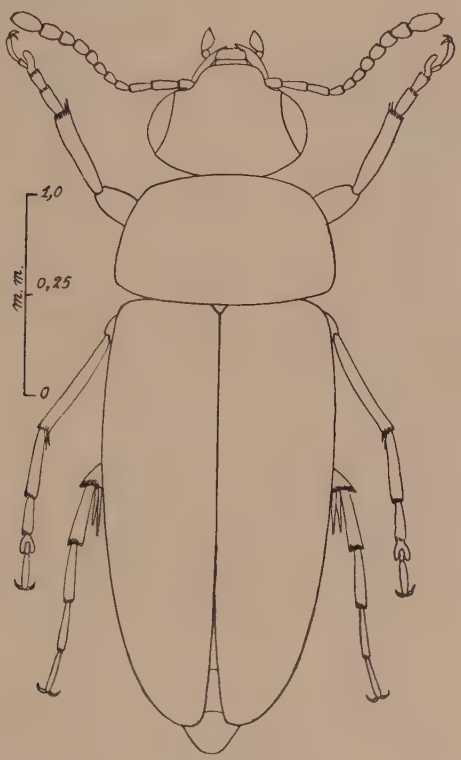


Fig. 1.—*Akentra balfour-brownei* sp. n.

Forty-two specimens of which 33 (18 ♂ and 15 ♀) are labelled " From *Protea abyssinica*, Flower No. 3, Stage 4, Drakensberg, Cathedral Peak Area, 18.xii.1951, E.A.C.L.E. Schelpe, B.M. 1952–336," and 9 (6 ♂ and 3 ♀) labelled " From *Protea abyssinica* Flower No. 1, Stage 4, Natal, Bergville Div., Roy. Natal Nat. Park, 28.xi.51, E.A.C.L.E. Schelpe, B.M. 1952–336." Type, and many co-types in the collection of the British Museum; some co-types in my personal collection and in the Museo Civico di Genova.

Considerations on the Subfamily.

It may be helpful to make some observations on the structure of the hind legs in the Anaspidinae, mainly with regard to the possible function of the

different types of apical ridges in relation to the habits of the beetles themselves.

Regardless of the significance of the dorso-lateral ridge sometimes present on the hind tibiae and tarsal segments, and sometimes also on the middle tibiae, the function of which is not at present known, it is evident that the most variable feature of the hind legs in this group of beetles is found in the apical margin of the tibial and tarsal segments. In *Cyrtanaspis* (fig. 5 (1)) we find that all hind tarsal segments and the hind tibiae have transversely truncate apical margins; the tibial spurs are extremely short and exile; and

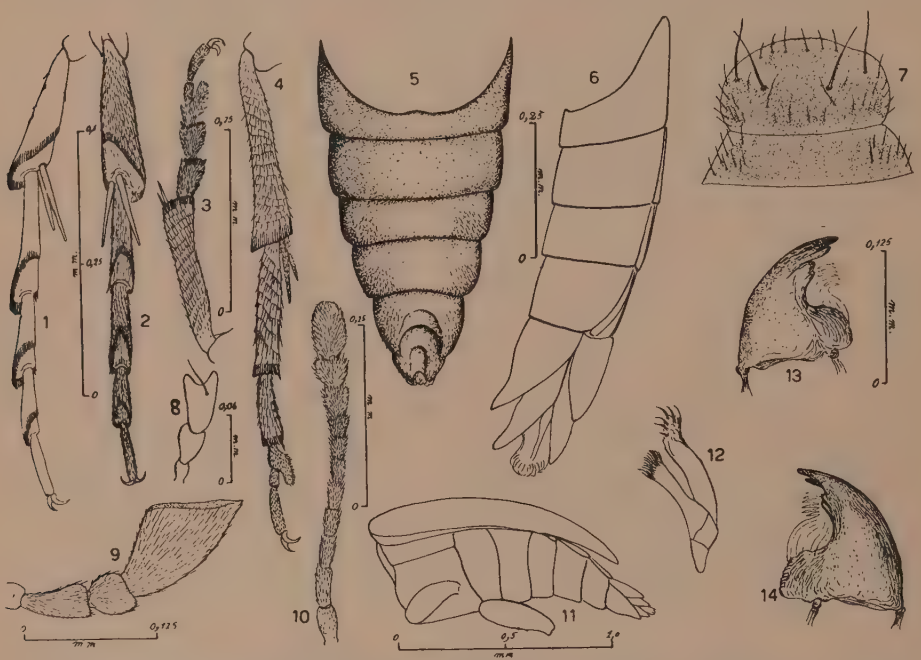


FIG. 2.—*Akentra balfour-brownei* sp. n.: (1) and (2) hind legs, from lateral and ventral view; (3) front leg; (4) middle leg; (5) abdomen of male; (6) same, in lateral view, (another specimen); (7) anteclypeus and upper labium; (8) labial palpus (♂); (9) maxillary palpus (♂); (10) antenna (♂); (11) lateral view of metathorax and abdomen; (12) lacinia and galea; (13) left mandible, from above; (14) same, from below.

the hind tibiae are slender, very little dilated at their apex. In *Striganaspis* (Ermisch 1949–50 : 88, fig. 21*e*) we still find transversely truncate hind tarsal segments, whereas the tibial margin is quite sharply obliquely truncate; the tibial spurs (*l.c.*, fig. 21*e*, shows only one spur, but nothing is said about this feature in the description) are still small, though a little longer and more robust than in *Cyrtanaspis*; the tibiae are more robust and rather dilated at their apex. Finally in *Anaspis* s.l. (fig. 5 (2–7*a*)) the tibiae and tarsal segments 1–3 are constantly obliquely truncate at a very sharp angle, which is least in the subgenus *Larisia* (especially *L. dichroa* Emery, fig. 5 (7–7*a*)). In this genus the tibial spurs are very long and robust, almost reaching, in some instances,

two-thirds the length of the first tarsal segment. The tibiae, furthermore, are always rather dilated at their apex, and this dilation is extreme in *Larisia* Muls. However, even in this latter sub-genus it is notable that the tibia and tarsal segments 1–3 have an apical ridge which, though extremely oblique, always runs more or less parallel to the true apex. In *Akentra*, on the other hand, the apical ridge is clearly so oblique that it leaves the true apical margin, which therefore remains free and still only slightly oblique (figs. 2 (1–2); 5 (8–9)), whilst there is, at least in *A. inoptata* and *A. basicornis*, a noticeably widened apical tibial margin and very long tibial spurs. It may furthermore be noted that the more oblique the apical ridge, the wider are the tibiae at their apex, which suggests a major development of tibial muscles.

This variation in the structure of the hind legs in Anaspid genera is probably associated with differences in their ability to walk, climb or jump.

From my observations, an *Anaspis* s.l., when jumping, does not use the apical margin of the tibiae nor of the tarsal segments, but merely the apex of the hind tibial spurs. Nevertheless, when climbing or walking, whilst all the segments of the front and middle tarsi touch the surface and the spurs of the front and middle tibiae help the insect to propel itself, the hind legs are held in such a way that only the apex of the hind tibial spurs, the apical margin of the first tarsal segments, and of the three last tarsal segments are in contact with the surface, so that the point with which the segment grips the surface asperities is provided by its apical ridge. It may therefore be assumed that the more developed and robust the hind tibial spurs, the greater the angle the femora and tibiae can provide for the jumping impulse (and thus the impulse will also be greater); and also that the more oblique the apical margin, the greater its capacity to obtain a purchase on asperities on the substrate and thus assist the insect in its walking or climbing movements. Obviously in *Cyrtanaspis* the hind legs have to be extended until almost flat to enable the tibial spurs to grip the substratum and therefore both femora and tibiae have an extremely small angle for developing their jumping impulse.

If these considerations are not entirely unfounded, we can therefore assume that, at least from a structural point of view, *Cyrtanaspis* is unable to jump, or at least has only limited capacity for doing so (this might also account for the very slender and exile hind tibiae), whereas it may be expected to be well developed in *Anaspis* s.l. and to attain its maximum in *Akentra*. Direct observation has been possible with *Anaspis* s.l., but not with *Cyrtanaspis* (an extremely rare, monobasic genus, of which I have never seen living specimens) nor with *Akentra*. This interesting problem could be definitely solved if living specimens of these two last genera could be obtained for examination.

Anaspis (Spanisa) subhumerosa sp. n. (Fig. 3).

Spanisa differs from all other subgenera of *Anaspis* s.l. mainly in having the last three segments of the antennae, in both sexes, much wider and a little longer than the preceding ones. The new species entirely agrees with the sub-generic characters of *labiata* Costa, type species of *Spanisa*. Fig. 4 (3) and (8) show the antennae of both these species for direct comparison.

The new species may be distinguished from the other three known species of *Spanisa* by the following key :

1 (4) Ground colour of body uniformly black; mouth-parts, base of antennae and part of legs only, of more or less clear brown colour; elytra without markings.

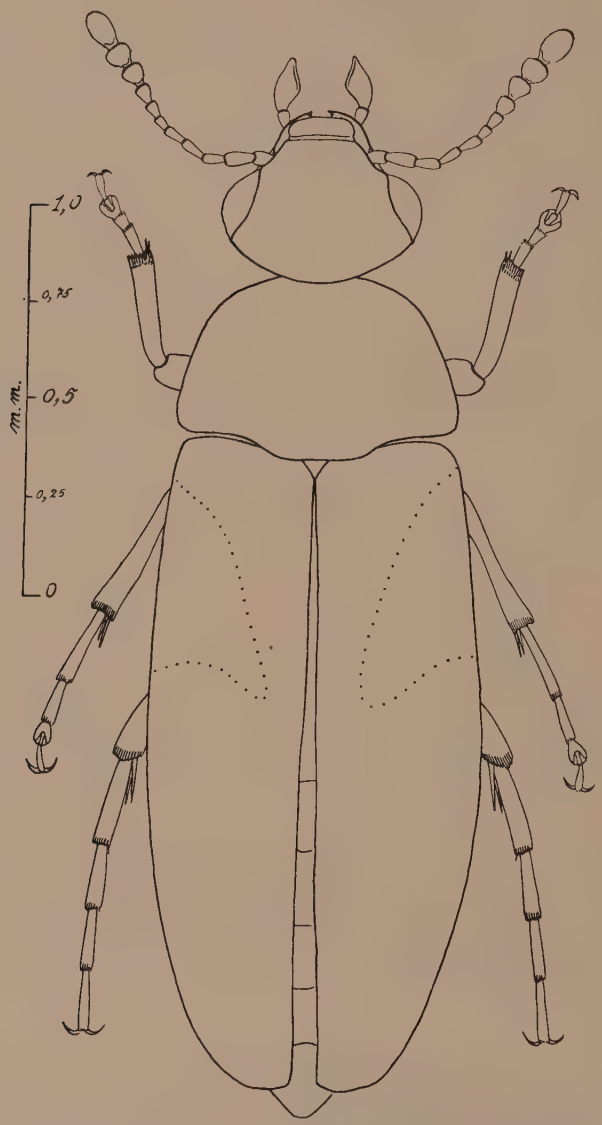


Fig. 3.—*Anaspis* (*Spanisa*) *subhumerosa* sp. n.

2 (3) Body slender, very little dilated at middle; antennae, when turned backwards, scarcely extending beyond base of pronotum, which is almost square; ♂ with 5th sternite of abdomen triangularly impressed from near its base, and emarginate

at tip. Length 1·8–2 mm. Transylvania, Serbia, Southern Russia[3] . . . . . **subtilis** Hampe

3 (2) Body more elliptical, a little more dilated at middle; antennae, when turned backwards, extend well beyond base of pronotum, which is much wider than long; impression of 5th sternite of abdomen in ♂ much shorter, the sternite a little narrower, emargination at tip very narrow and rather deeper than in *subtilis* Hampe. Length 1·3–1·7 mm. Mediterranean area (France, Spain, Italy, Corsica) . . . . . **labiata** Costa

4 (1) At least the elytra bearing more or less subhumeral markings of a reddish-yellow colour; head and pronotum sometimes also red-yellow.

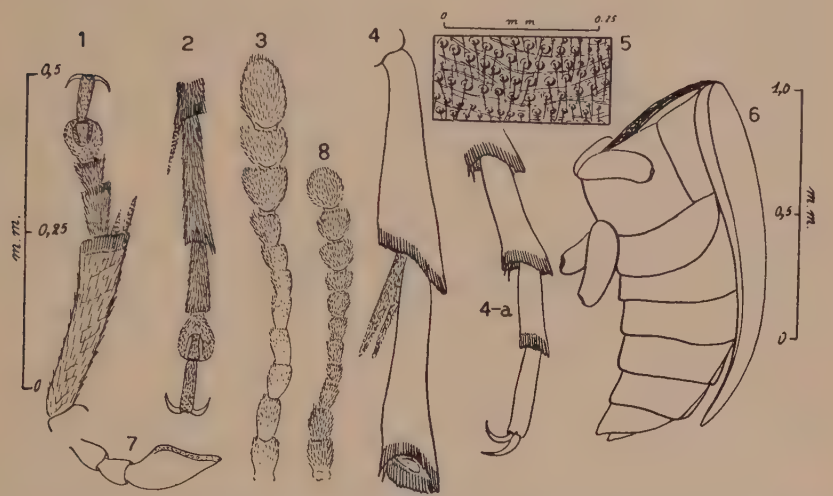


FIG. 4.—*Anaspis* (*Spanisa*) *subhumerosa* sp. n.: (1) anterior leg; (2) middle tarsus; (3) antenna; (4, 4*a*) lateral view of posterior leg; (5) pattern of sculpture of head on frons; (6) lateral three-quarter view of metathorax and abdomen; (7) maxillary palpus of ♀; (8) antennae of *A.* (*Spanisa*) *labiata* Costa.

5 (6) Length between 1·5 and 1·8 mm. Head, pronotum and shoulders of elytra and sometimes also epipleural margin, reddish-yellow. Body rather short and elliptical, as in *labiata*. Palestine (Jerusalem). . . . . **aharoni** Reitter

6 (5) Length above 2·5. Head and pronotum black; one subhumeral, subtriangular spot on each elytron of a dark red colour; body rather elongate, parallel-sided. Natal (Drakensberg) **subhumerosa** sp. n.

Length (mm.): head 0·45; pronotum 0·6; elytra 1·5; total 2·55 (♀).
Width (mm.): head 0·5; pronotum 0·75; elytra 0·7 (♀).

Ground-colour black; elytra with a dark red triangular subhumeral spot, not reaching suture (fig. 3); all legs yellow, the hind ones a little darker; anteclypeus, mouth-parts, maxillary palpi (with the exception of a narrow black line at apex of last segment) and

[3] The record for Isola di Pianosa (Adriatic Sea) has still to be confirmed.

antennae from segments 1 to 5 pale yellow; segments 6–11 gradually darkened, becoming brownish-piceous. Pubescence short, decumbent, pale and shining.

General form as in fig. 3.

Head rather convex, sub-elliptical; ground sculpture of a very unusual pattern (fig. 4 (5)): comprising a concentric series of punctures in which the hairs are inserted, extending over head surface, moderately impressed, and with elevated margins; between each series of punctures is an impressed line; these lines sometimes running concentrically, and

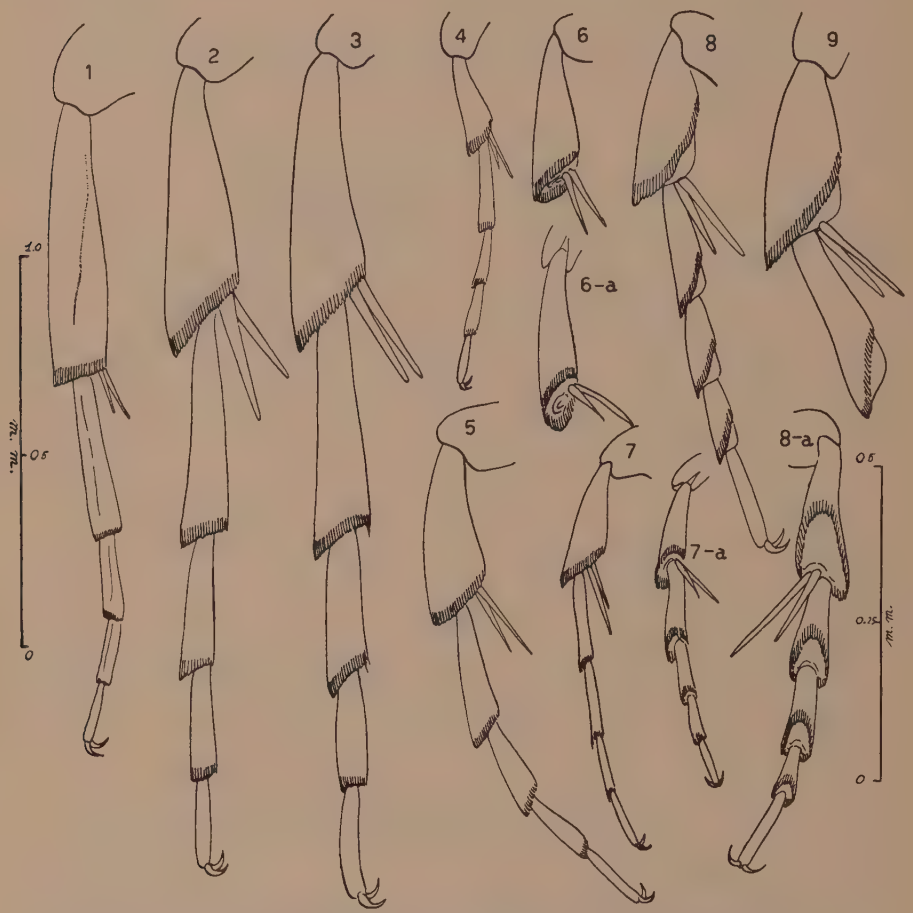


FIG. 5.—Various types of hind legs in the *Anaspidini*: (1) *Cyrtanaspis phalerata* Germ.; (2) *Anaspis* (*Nassipa*) *flava* L.; (3) *Anaspis* (s. str.) *frontalis* L.; (4) *Anaspis* (*Spanisa*) *labiata* Costa; (5) *Anaspis* (*Silaria*) *brunnipes* Muls.; (6, 6*a*) (tibia only) *Anaspis* (*Larisia*) *chevrolati* Muls. (7, 7*a*) *Anaspis* (*Larisia*) *dichroa* Emery; (8, 8*a*) *Akentra inoptata* Francisc.; (9) (tibia and 1st tarsal article only) *Akentra basicornis* Francisc.

at others intersecting; interspaces between punctures and line shining with no granulation visible even at high magnification. Eyes convex, subelliptical, the granulation rather coarse, but not as coarse as in *labiata*; front margin of eyes deeply sinuate behind insertion of antennae; maxillary palpus of ♀ as in fig. 4 (7). Antennae, when turned backwards, reaching scarcely the middle of sides of the pronotum; pubescence of segments 1–6 extremely

short and scarcely visible, whereas it becomes stiffer and longer on remaining segments (fig. 4 (3)). Mouth-parts have not been studied as insufficient material was available for mounting specimens in microscopical preparations.

Pronotum (fig. 3) with a fine transverse strigation, in which hairs are inserted; surface between strigae very finely and transversely shagreened; anterior angles exactly square from which lateral margin runs almost straight (seen from one side) to basal angles, which are slightly acute, widely rounded at apex; base with a rather large, truncate lobe.

Scutellum small, exactly triangular.

Elytra (fig. 3) bearing a sculpture similar to that of pronotum, but interspace between strigae entirely shining; apex of each elytron shortly rounded. Epipleurae as wide at base as one-third of metepisterna, and extend, gradually narrowing but quite visible, as far as third abdominal sternite (fig. 4 (6)) representing the posterior part of the insect seen in oblique aspect.

Abdomen as in fig. 4 (6); ground pubescence black, but apical margin of each sternite with a fine fringe of short, whitish and shining hairs. Nothing is known of abdominal structure in male.

Front legs as in fig. 4 (1); middle tarsi as long as middle tibiae (fig. 4 (2)); hind legs (tibia and tarsi) as in fig. 4 (4, 4*a*). Small series of spines at apex of tarsal segments and tibiae of all legs, with the exception of the longer spurs, black, remaining parts of legs pale yellow.

Type, female, and 1 ♀, co-type, labelled "From *Protea abyssinica*, Flower No. 3, Stage 4, Natal, Drakensberg, Cathedral Peak Area, 18.xii.1951, E.A.C.L.E. Schelpe, B.M. 1952–336." In the collections of the British Museum.

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THREE NEW SPECIES OF KALOTERMITIDAE (ISOPTERA) FROM EAST AFRICA.

By W. Wilkinson, B.Sc.

(*Termite Research Unit, East African Agricultural and Forestry Research Organisation.*)

Kalotermes kempae sp. n.

Imago (Fig. 1, A–E).—Head capsule shining, medium brown, darker on vertex; epicranial suture visible in some specimens as a fine yellow line. Eyes black, moderately large and convex. Ocelli yellowish, twice as long as broad, set at about 40° to the long axis of the eyes, which they touch posteriorly. Labrum light brown; front margin strongly and evenly curved to distinct front angles; sides converging posteriorly. Antennae mostly 15-16 segmented; segments 1, 3 and the distal eight always elongate. Mandibles as figured; anterior edge of 2nd marginal tooth of left mandible rather longer than in most *Kalotermes*.

Pronotum slightly paler than head and a little narrower; shape fairly constant, the front margin distinctly concave, sides evenly rounded, and hind border shallowly emarginate. Meso- and metascuta yellow-brown, with dark brown sagittal ridge. Wings hyaline; costa and radial sector medium brown, the veins linking the latter with the media tending to be pigmented also; venation somewhat variable, but of *Kalotermes* pattern. Legs slender; pale yellow, with setae, apical spines and tips of claws darker. Abdominal tergites about same colour as pronotum, sternites cream.

	Mean.	Mm.
Length of head to front angles . .	1·00	(0·88–1·09)
Width of head across eyes . . .	1·12	(1·09–1·17)
Length of ocellus	0·17	(0·16–0·18)
Width of ocellus	0·09	(0·08–0·09)
Greatest diameter of eye . . .	0·37	(0·34–0·38)
Maximum length of pronotum . .	0·78	(0·73–0·81)
Maximum width of pronotum . .	1·08	(1·02–1·17)
Length of fore wing	9·0	(8·8–9·0)
Width of fore wing	2·5	(2·4–2·6)
Length of hind tibia	1·05	(0·99–1·09)

The description is of specimens from the type locality. Colonies have recently been taken in *Acacia* in the Kedong Valley, Kenya, which differ in that the alate has a variably larger eye (0·38–0·45 mm. diameter), but which may prove to be attributable to this species.

Soldier (Fig. 1, F–M).—Head capsule reddish-ochraceous, frons and antennal carinae darker; epicranial suture faintly visible in some. Dorso-ventrally flattened, greatest depth being only two-thirds of maximum width. Frons hollowed, this and frontal ridge cross-striate to a varying degree; setae small and sparse, but more numerous just behind antennal carinae, which are large. Eyes comparatively large, slightly convex, and darkly pigmented in most specimens. Ocelli small but distinct pale oval spots. Labrum light brown, transverse, with median anterior projection and well rounded antero-lateral angles. Antennae 11–13 segmented; 2nd quadrate to slightly elongate; 3rd always very long,

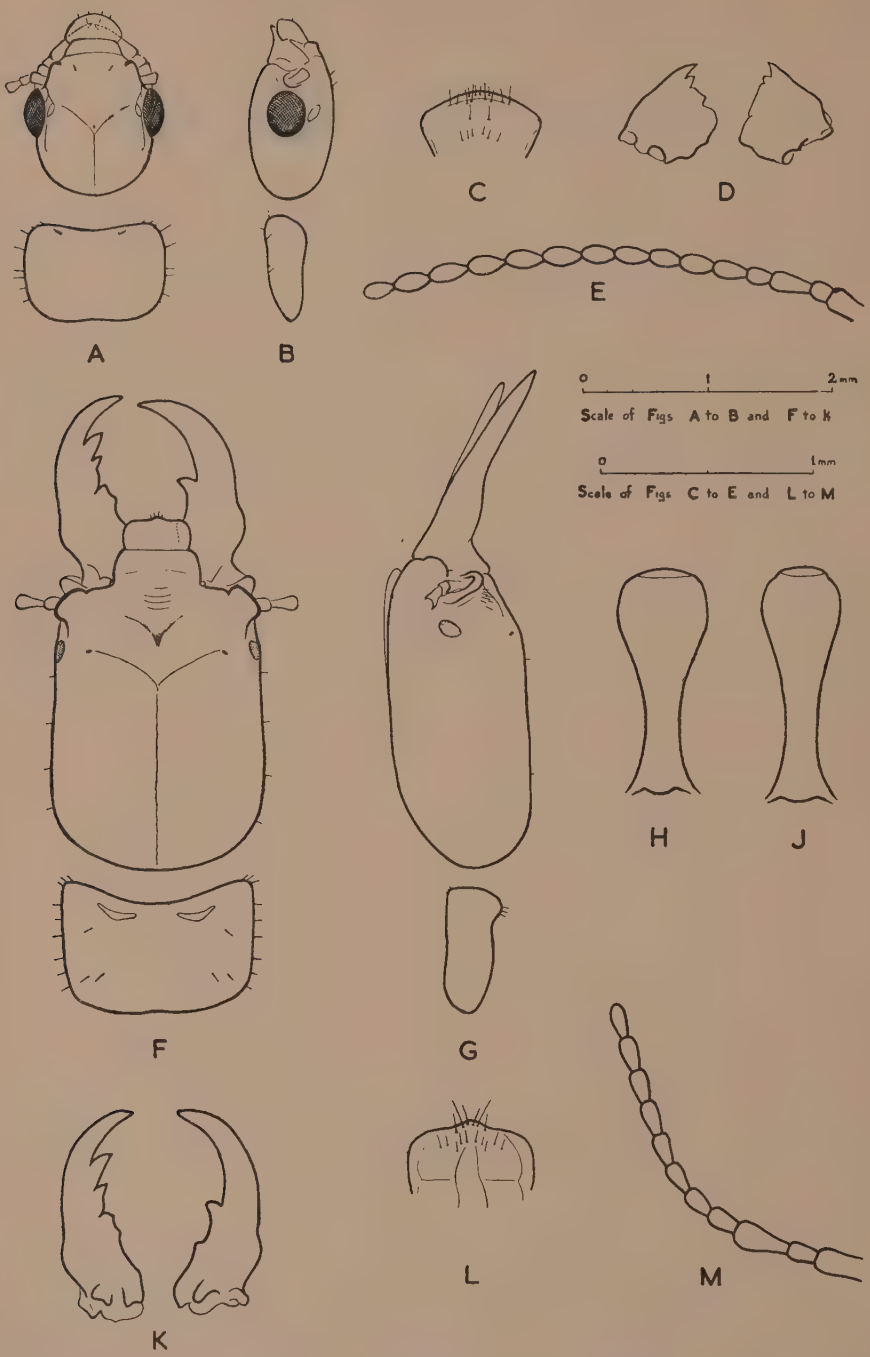

Fig. 1.—*Kalotermes kempae* sp. n. A–E, Imago: A, head and pronotum from above; B, lateral view of same; C, labrum; D, mandibles; E, antenna. F–M, Soldier: F, head and pronotum from above; G, lateral view of same; H, gula of type; J, gula of a paratype to show variation range; K, mandibles; L, labrum; M, antenna.

clavate and of same colour as head ; segment 4 onwards becoming paler and a little more elongate. Gula ochraceous, rather variable, but broadest part usually three times as wide as the waist. Base of mandible ochraceous, this colour sometimes extending over distal two-thirds, which are normally black ; strongly curved, shaped as figured.

Pronotum pale ochraceous ; almost as broad as head ; front margin raised and concave ; anterolateral angles well marked in most ; sides fairly straight, slightly converging posteriorly ; hind margin lightly curved, often with slight median emargination. Meso- and metanota intermediate in colour between pronotum and abdomen ; variable in shape, with tendency to have rather large wing rudiments. Legs pale yellow ; setae, spine and claws red-brown. Abdomen pale yellow.

	Mean.	Mm.
Length of head with mandibles . .	3·50	(3·17–3·73)
Length of head to front angles . .	2·25	(1·97–2·40)
Maximum head width . . .	1·58	(1·45–1·65)
Width of head at front angles . .	1·41	(1·30–1·48)
Maximum head depth . . .	1·07	(0·98–1·12)
Length of left mandible . . .	1·60	(1·44–1·69)
Maximum length of pronotum . .	1·02	(0·95–1·05)
Maximum width of pronotum . .	1·49	(1·41–1·55)
Length of hind tibia	1·11	(0·98–1·26)

Relationships.—This species is a member of the *aethiopicus* group, for which there may be some justification in reviving Silvestri's name *Epicalotermes*, perhaps as a subgenus. Group characters most readily recognised in the soldier are large, strongly curved mandibles with particular dentition ; transverse labrum with median anterior projection ; and a pronotum which, though variable, tends to be transversely rectangular, with defined anterolateral and posterolateral angles.

The most obvious specific character, easily recognisable in the field, is the very flat head of the soldier.

Described from 10 alates and 16 soldiers in the type colony at Mwakijembe, Tanganyika, together with abundant material from many other colonies in the same locality.

Holotype : alate female. British Museum (Natural History).
Allotype : alate male. British Museum (Natural History).
Morphotype : soldier. British Museum (Natural History).

Type locality.—Tanganyika Territory : Mwakijembe, Tanga District, vii, 1951, from *Acacia* log (*P. B. Kemp*, K. 403).

Other records.—Tanganyika ; Kwale, near Tanga, x.1950 (*P. B. K.*, K. 30) : Kitivo, West Usambara, v.1952 (K. 560) : Buiko, West Usambara, v.1952 (K. 560), living in the dead snags on *Acacia* spp. in dry bushland.

Glyptotermes kawandae sp. n.

Imago (Fig. 2, A–F).—Head capsule fairly dark brown, paler beneath and towards articulation of mandibles, with yellow flecks at the bases of the scattered setae. Epicranial suture evident as a distinct thin yellow line. Eyes black, moderately convex, shaped as figured. Ocelli small, almost round ; in most specimens separated from the eye by about two-thirds of their diameter. Labrum rounded at sides, broadly truncate anteriorly. Antennae mostly with 13 or 14 segments. Segment 3 variable in length, transverse to elongate, but never longer than segment 1 ; segments increasing gradually

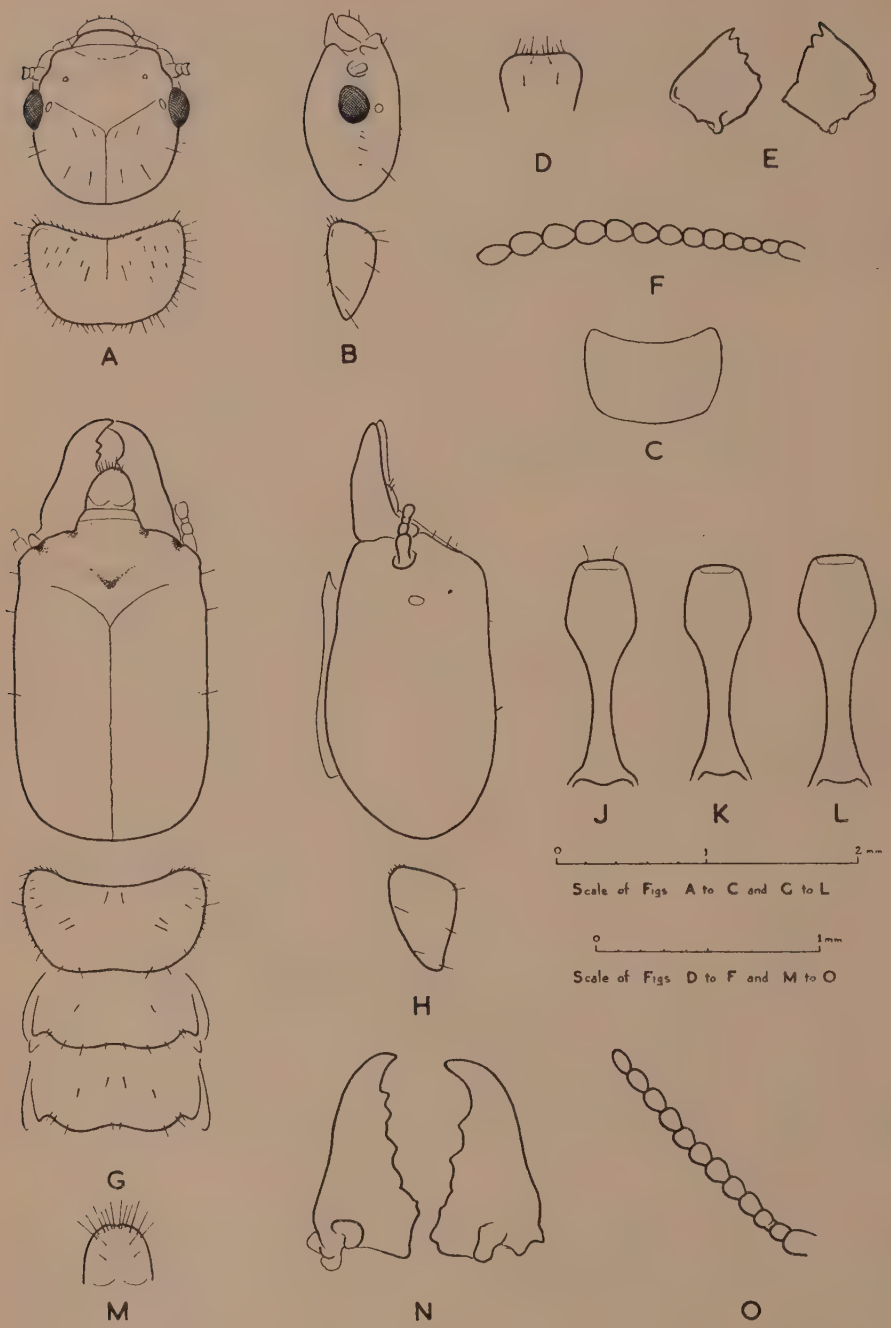

FIG. 2.—*Glyptotermes kawandae* sp. n. A–F, Imago: A, head and pronotum from above; B, lateral view of same; C, alternative shape of pronotum when sides are bent down to a greater extent; D, labrum; E, mandibles; F, antenna. G–O, Soldier: G, head and thorax from above; H, head and pronotum from side; J, gula of type; K and L, variant gulae of paratypes; M, labrum; N, mandibles; O, antenna.

in size from 4th onwards, becoming proportionately longer, from quadrate to slightly elongate ; terminal segment distinctly narrower than penultimate. Mandibles pale brown, much darker along toothed edge ; shaped as figured.

Pronotum about same colour as head, with pale flecks, very slightly narrower than head ; fine black median line on anterior half only. Front margin moderately emarginate ; sides converging to hind angles, which are weak ; hind margin lightly curved, with a very slight median emargination in some specimens. Sagittal ridges of meso- and metathorax apparent as dark lines on the scuta. Wings brown, colour due to the dark papillae, which are fairly dense, there being about 10 in a direct line between the median and cubitus ; *Glyptotermes* venation ; costa, radius and media scaled, costa with short setae. Abdominal tergites very little paler than head, sternites somewhat lighter.

	Mean.	Mm.
Length of head to front angles	1·03	(0·99–1·09)
Width of head across eyes	1·09	(1·06–1·13)
Diameter of ocellus	0·06	(0·05–0·09)
Distance between ocellus and eye	0·04	(0·03–0·05)
Greatest diameter of eye	0·26	(0·23–0·29)
Maximum length of pronotum	0·67	(0·65–0·73)
Maximum width of pronotum	1·01	(0·95–1·15)
Length of fore wing	6·4	(6·1–6·6)
Width of fore wing	1·7	(1·6–1·8)
Length of hind tibia	0·96	(0·90–1·02)

Soldier (Fig. 2, G–O).—Head capsule ochraceous, with frons darker ; parallel sided and elongate, length to front angles about twice the width at this place. Antennal carinae projecting slightly ; epicranial suture visible as a thin, pale line ; setae sparse. Eyes rudimentary, small, pale ovals. Ocelli minute pale spots. Anteclypeus white, labrum pale ochraceous, tongue-shaped, with shallow, median anterior emargination. Antennae 12 segmented ; 2 and 4 of equal length, 3 variable or partly subdivided ; 5 to 9 increasing gradually in length, but scarcely more than quadrate at most ; 12 as long as 11 but distinctly narrower. Gula ochraceous, anterior margin convex ; broadening evenly from front angles for one-quarter of its length to its widest part, where it is at least 3 times as broad as the waist behind. Mandibles brown to black, with base paler ; shaped as figured.

Pronotum yellow, edges ochraceous, transversely arched ; anterior margin concave ; sides broadly rounded onto posterior margin which is somewhat emarginate ; as broad, or very nearly as broad as head. Meso- and metanota pale yellow, posterior margins slightly emarginate and tinged ochraceous. Legs pale yellow, stout, apical spines darker, rather blunt. Abdomen almost white, setae and tergites IX and X darker.

	Mean.	Mm.
Length of head with mandibles	2·94	(2·89–2·99)
Length of head to front angles	2·17	(2·11–2·22)
Maximum head width	1·32	(1·30–1·37)
Width of head at front angles	1·10	(1·08–1·12)
Length of left mandible	0·97	(0·95–0·98)
Maximum length of pronotum	0·77	(0·74–0·80)
Maximum width of pronotum	1·29	(1·26–1·33)
Length of hind tibia	0·90	(0·88–0·94)

Relationships.—Belonging to the *parvulus* group ; close to *G. insulans* Silvestri, from which it differs as follows : *Alate :* Ocellus smaller by about one-third, and comparatively farther from the eye. Antennae more slender. *Soldier :*

Head slightly more elongate, forehead steeper; gula distinctly narrower, and with better defined waist.

Described from 1 dealate male and 40 soldiers in a dead branch at Kawanda, Uganda, and from 36 alates found swarming later in the same locality.

Holotype: dealate male. British Museum (Natural History).
Allotype: alate female. British Museum (Natural History).
Morphotype: soldier. British Museum (Natural History).

Type locality.—UGANDA: Kawanda, i.1947, in dead branch of *Xymalos monospora* (*W. V. Harris*, No. 476). Allotype from alates swarming from *Conopharyngia holstii*, at 16.00 hours, iii.1947 (*W. V. H.*, No. 489).

Glyptotermes reticulatus sp. n.

Imago (Fig. 3, A–E).—Head capsule almost evenly brown; temples parallel for at least half length of eye; traces of epicranial suture just visible in some specimens. Frons with pale pyriform patches near antennal fossae; clypeofrontal suture distinct and yellow. Shallow groove running posteriorly from upper edge of each eye; head surface distinctly finely reticulate, with few scattered setae. Eyes black, rather flatly convex, irregularly sub-oval as figured. Ocelli white; very near eyes; tear-shaped with point directed towards middle of frons. Labrum yellow; anterior margin straight, curving round to convex sides. If antennae are 10 segmented, then 3rd is longer than 2nd or 4th. Segments 4 to 6 quadrate; 7 to 10 slightly elongate, increasing gradually in length, terminal segment a little narrower than penultimate. Third segment more often divided into two smaller segments, thus producing an 11 segmented antenna. Mandibles pale brown, black along biting edge; shaped as figured.

Pronotum about same colour as head and of same width; finely reticulate, with incomplete faint median groove. Clearly flanged along anterior and lateral margins, this being emphasised by the paler colour of the flange. Front margin moderately emarginate; anterolateral angles well rounded; sides curving evenly onto straight posterior margin, or posterolateral angles somewhat flattened to give the effect of a double corner. Sagittal ridge showing black on meso- and meta-scuta. Meso- and meta-scutella have grooves running parallel to the borders, and straight posterior margins. Wings pale brown, there being about 5 papillae in a direct line between median and cubitus. *Glyptotermes* venation; costa, radius and media strongly chitinised, pigmented and scaled; costal margin with single row of short, semi-recumbent setae. Coxae and femora yellow-brown, tarsi and tibia 1 yellow, tibiae 2 and 3 almost white; apical spines dark yellow, weakly toothed. Abdominal tergites of same colour as head; sternites almost as dark, II to V paler in midline.

	Mean.	Mm.
Length of head to front angles	0·74	(0·73–0·77)
Width of head across eyes	0·80	(0·77–0·81)
Length of ocellus	0·08	.
Width of ocellus	0·05	.
Distance between ocellus and eye	0·02	.
Greatest diameter of eye	0·23	(0·22–0·25)
Maximum length of pronotum	0·49	(0·47–0·51)
Maximum width of pronotum	0·68	(0·67–0·71)
Length of fore wing	4·5	(4·2 –4·6)
Width of fore wing	1·0	.
Length of hind tibia	0·64	(0·60–0·65)

Soldier (Fig. 3, F–L).—Head capsule brown; parallel sided and somewhat elongate; epicranial suture not visible. Distinctly finely reticulate, with sparse setae. Eyes pale

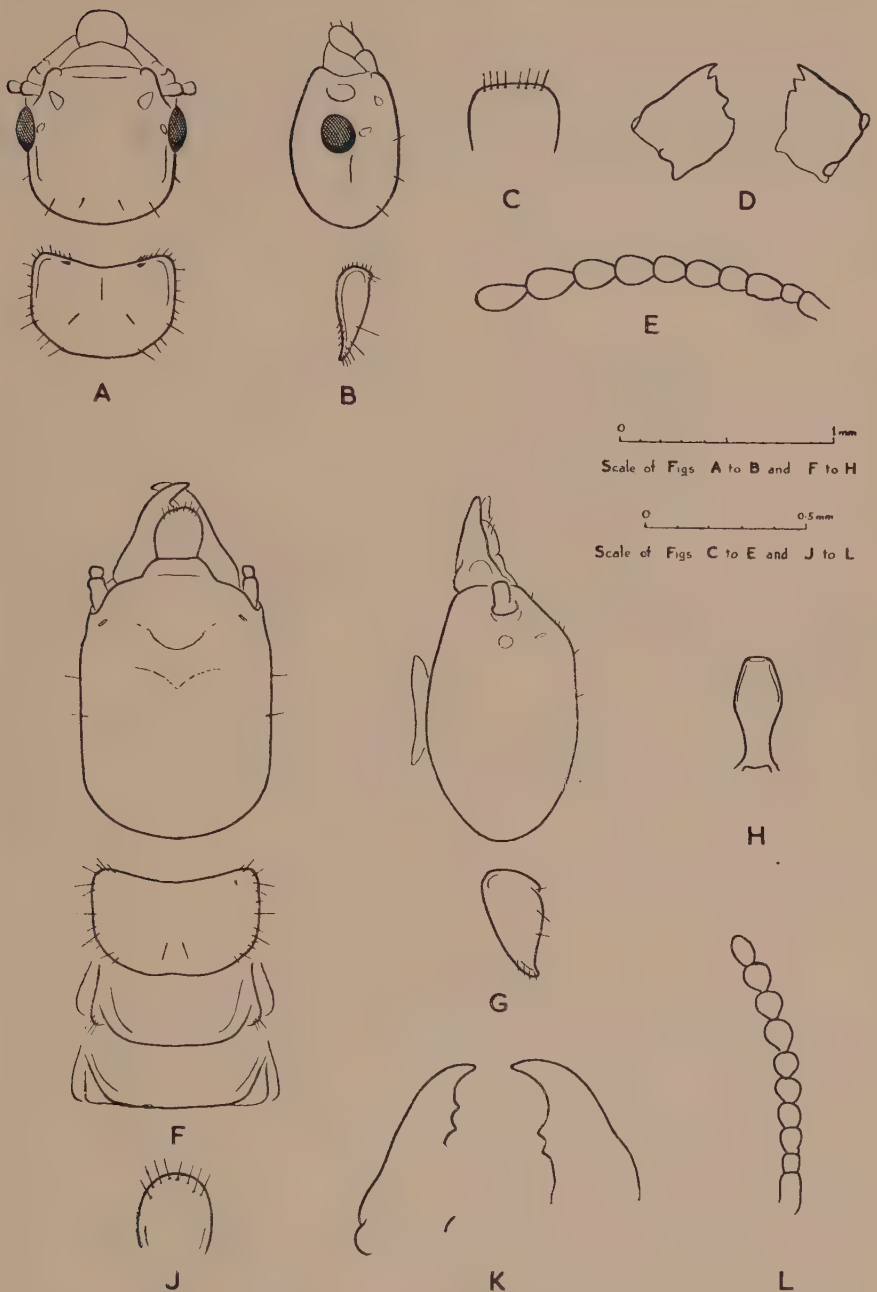

FIG. 3.—*Glyptotermes reticulatus* sp. n. A–E, Imago, A, head and pronotum from above; B, lateral view of same; C, labrum; D, mandibles; E, antenna. F–L, Soldier: F, head and thorax from above; G, head and pronotum from side; H, gula; J, labrum; K, mandibles; L, antenna.

yellow-grey, slightly convex. Pale, elongate ocellar patch. Anteclypeus yellowish; labrum light brown, tongue-shaped. Antennae 10 segmented, somewhat flattened; segments 5 to 9 transverse to quadrate; 10 slightly elongate, narrower than 9. Gula light brown; broadest just before middle, which is not quite twice as broad as waist (12 : 7); anterior half with upturned flange at sides. Mandibles black, figured as far as visible.

Pronotum yellow, a little narrower than head; transversely arched and faintly reticulate. Anterior margin concave; sides fairly straight, weakly flanged; hind angles well rounded to posterior margin, which is very slightly emarginate; shallow median groove. Meso- and metanota pale yellow; posterior margin almost straight. Legs yellow, stout; apical spines short and thick. Abdomen pale yellow, setae and tergites brownish.

	Mm.
Length of head with mandibles	1·90
Length of head to front angles	1·18
Maximum head width	0·90
Width of head at front angles	0·72
Length of left mandible	0·61
Maximum length of pronotum	0·51
Maximum width of pronotum	0·85
Length of hind tibia	0·56

Relationships.—A distinctive species, not easily confused with other African *Glyptotermes*. There are several notable features, among which are the distinct reticulation; broad, flat antennal joints; and, in the alate, the flanged thorax and pointed ocelli.

Described from 9 alates, 1 dealate, 1 soldier and 39 nymphs.

Holotype: alate female. British Museum (Natural History).
Allotype: alate male. British Museum (Natural History).
Morphotype: soldier. British Museum (Natural History).

Type locality.—Zanzibar: Jozani Forest, viii.1951, in fallen log of *Vitex* sp. (*W. V. Harris & P. B. Kemp*, No. 775).

Book Notice.

Insecticides and Colonial Agricultural Development. Edited by T. Wallace and J. T. Martin. Large 8vo. London (Butterworth's Scientific Publications), 1954. Pp. x + 169, pls., text illust. Price 30*s.* 0*d.*

This volume comprises the papers contributed to the Sixth Symposium of the Colston Research Society, held in the University of Bristol in March, 1953.

The subjects selected for discussion deal with a wide range of problems in widely separated areas, and include the importance of crop protection to the colonies, colonial insecticide research, locust control, control of cotton pests, crop protection in East and West Africa, the rôle of insecticides in the British Caribbean Territories, losses caused by insects during storage and transit, control of pests and parasites of livestock, spraying technique and machinery, and, finally, insecticide manufacturers' research and supply problems.

Full reports of the discussion arising from the papers are also included.

NOTES ON THE GENUS *LIPAPHIS* MORDVILKO, 1928 (HOMOPTERA : APHIDIDAE) AND DESCRIPTION OF A NEW SPECIES.

By J. P. Doncaster, M.A., F.R.E.S.

British Museum (Natural History).

The genus *Lipaphis* was erected by Mordvilko (1928) with *Aphis erysimi* Kaltenbach as type. Börner (1952) recognised two subgenera : (1) *Lipaphis sensu stricto*, containing the species *erysimi* (Kltb., 1843), *fritzmülleri* Börner, 1950, *alliariae* F. P. Müller sp. n. in litt., *lepidii-cardariae* Knechtel & Manolache, 1944, *ruderalis* Börner, 1939, *lepidii* Nevsky, 1929, and *pseudobrassicae* Davis, 1914 ; and (2) *Smiela* Mordvilko, 1929, type *S. fusca* Mordv., 1929 (syn. *Lipaphidoides* Börner, 1939, type *Lipaphis rossi* Börner, 1939) containing *rossi* Börner, 1939, *turritella* Wahlgren, 1938, *fusca* Mordv., 1929, and *hedickei* Börner, 1952. All are associated with cruciferous host-plants.

Through the courtesy of Dr. Hille Ris Lambers and Dr. F. P. Müller I have been able to examine material of all these species except *fusca* and *hedickei*, with the result that I can find little justification for Börner's separation of *Smiela* from *Lipaphis*. Neither the very brief description of *fusca* by Mordvilko (1929) nor the rather fuller characterisation given by Shaposhnikov (1950) show good reason to separate *fusca* from *Lipaphis* s.s. The species *rossi* Börner and *turritella* Wahlgren appear to differ from other *Lipaphis* species only in possessing dark sclerotic abdominal bands in the apterae, but as these bands vary in density and extent, it is doubtful whether they can be considered a reliable character on which to base a subgenus. With regard to *hedickei*, Börner applies this name to a species reported as forming galls on *Crambe maritima*, but states that he has not been able to examine the insects, and gives no description of their morphology. He apparently includes the species in *Smiela* solely on account of its host plant associations.

On the other hand, as Dr. Hille Ris Lambers has pointed out in correspondence, there appears to be a well-defined natural group, distinct morphologically and biologically from other *Lipaphis* species, formed by the three species *lepidii* Nevs., *lepidii-cardariae* Kn. & Man., and *ruderalis* Börner, all of which are characterised by the presence in the apterae of a median dorsal protuberance on the eighth abdominal tergite, and all of which feed on species of *Lepidium*. It is therefore proposed to include them in a new subgenus, *Lipaphidiella* subgen. n., type *lepidii* Nevsky, 1929, and to regard *Smiela* as a synonym of *Lipaphis*.

Of the other species of *Lipaphis*, Dr. F. P. Müller has remarked in a letter that he regards his *alliariae* as a subspecies of *erysimi* Kltb. Macerated specimens of the two are almost indistinguishable, but in life there is a distinct colour difference, *erysimi* being dull grey or greenish-grey, and *alliariae* almost black. *Lipaphis pseudobrassicae* (Davis, 1914), a common pest of crucifers in North America, is believed by Hille Ris Lambers (1948) to be identical with *erysimi*

Kltb. *Aphis contermina* Walker, 1849, and *Aphis matthiolaella* Theobald, 1918, from stocks in Egypt, are also synonyms of *erysimi*.

Key to Species of *Lipaphis* Mordvilko

Apterae.

1 (6). Antennae one-third to half body length, joints IV, V, and base of VI subequal and together about equal to III. Ultimate rostral joint with 2 hairs in addition to preapical 3 pairs. Abd. VIII bearing median dorsal protuberance. On *Lepidium* spp. **Lipaphidiella** subgen. n.

2 (1). Cauda long, about equal to ant. III, with pronounced constriction about one-third of its length from base. Ult. rostral jt. short and blunt, about three-fifths length of second jt. of hind tarsus. Siphunculi corrugated on basal half. On *Lepidium ruderale* . . . . . **ruderalis** Börner.

3 (2). Cauda two-thirds to three-quarters of ant. III, rounded or conical but not constricted. Ult. rostral jt. about equal to hind tarsus II. Siphunculi imbricated but not corrugated.

4 (3). Protuberance on abd. VIII prominent and wart-like. Siphunculi three to three and a half times length of hind tarsus II. On *Lepidium draba* . . . . **lepidii-cardariae** Kn. & Man.

5 (4). Protuberance on VIII low and broadly rounded. Siphunculi two to two and a half times length of hind tarsus II. On *Lepidium* spp. . . . . **lepidii** Nevsky.

6 (1). Antennae five-ninths or more of body length; joints IV, V and base of VI together longer than III. Ult. rostral jt. with 3 or more hairs (excluding preapicals); if fewer, then abd. with sclerotic transverse bars. Abd. VIII without protuberance. On various Cruciferae . . . . Subgenus **Lipaphis** Mordv. s.s.

7 (10). Abdomen with broad dark sclerotic transverse bars. Siphunculi dark with broadly expanded base.

8 (7). Ult. rostral jt. with at least 4 hairs on basal part. Frontal hairs up to 25μ. On *Turritis glabra* . . **turritella** Wahlgren.

9 (8). Ult. rostral jt. with 2 hairs on basal part. Frontal hairs up to 10μ. On *Arabis hirsuta* . . . . . **rossi** Börner.

10 (7). Abdomen without sclerotic transverse bars. Siphunculi pale or dusky, not, or only slightly, expanded at base.

11 (10). Cuticle of head imbricate-spinulose. Ult. rostral jt. longer than hind tarsus II, slender, two and a half times its basal width. On *Matthiola* spp., *Arabis alba* . . . **matthiolae** sp. n.

12 (11). Cuticle of head smooth or rugose. Ult. rostral jt. shorter than hind tarsus II, one and three quarters times its basal width.

13 (14). Siphunculi more or less equal in length to cauda. Proc. term. less than twice as long as base of VI. On *Sisymbrium loeselii*. **fritzmülleri** Börner.

14 (13). Siphunculi one and a half times as long as cauda. Proc. term. more than twice as long as base of VI. On various Cruciferae **erysimi** Kltb. (incl. subsp. **alliariae** F. P. Müller).

Lipaphis matthiolae sp. n.

Apterous viviparous female.—Body broadly oval, cuticle sclerotic but not pigmented. Head pale, with dorsal and ventral surfaces imbricate-spinulose except on lateral frontal prominences which are rugose on their rounded inner margins. Median frontal prominence

conspicuous, somewhat rectangular in outline. Cephalic hairs up to 23μ, stout, apically expanded. Antennae about two-thirds body length, imbricate, pale except for apex of V and whole of VI which are dusky. Antennal hairs up to 10μ, expanded apically. Rostrum reaching to third coxae, apical joint rather long and slender, about two and a half times as long as its basal width, and one and a quarter times as long as second joint of hind tarsus, with 3–5 hairs besides the three preapical pairs. Abdominal dorsum with traces of faint reticular ornamentation, spinulose posteriorly in irregular transverse rows on tergites 7 and 8. Marginal tubercles minute, no larger than hair bases, present on segments 2–5. Abdominal hairs up to 14μ, similar in shape to antennal hairs, arranged in a single transverse row per segment. Ventral abdominal hairs up to 33μ, fine, acute, arranged

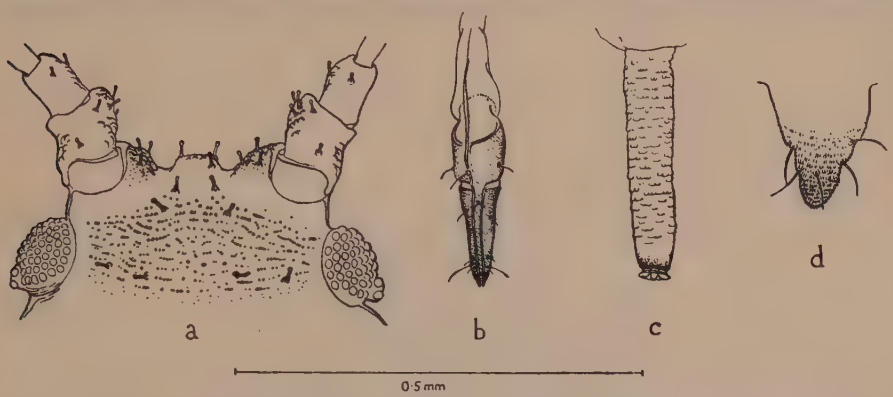

FIG. 1.—*Lipaphis matthiolae* sp. n., apterous viviparous female; *a*, head, *b*, rostrum, *c*, siphunculus, *d*, cauda.

in double transverse rows per segment. Eighth abdominal tergite with 4–6 rather long hairs, seventh with 8–10 hairs, and sometimes 1 or 2 minute median tubercles. Subgenital plate with 2 long acute hairs near anterior margin and 7–12 apically expanded hairs along posterior margin. Rudimentary gonapophyses 3. Siphunculi uniformly pale, slightly less than twice as long as cauda, cylindrical for most of their length, but narrowing slightly towards the apex, with a well-defined constriction bearing a few transverse striae just below the flange; imbricate except for apical one-sixth, which is smooth. Cauda pale, short, bluntly triangular, constricted at about one-third of its length below the apex, with 4 lateral hairs and 1 median dorsal. Legs pale, except for apices of tibiae, and the tarsi, which are dusky. Coxae imbricate with rather long acute hairs. Femora bluntly imbricate, sparsely clothed with apically expanded hairs. Tibiae with hairs of both types. First tarsal joints of fore and mid legs with 2 long fine hairs and a shorter hair between, those of hind legs with 2 long hairs only.

Measurements of Apterae (millimetres).

	Body length.	Antennae. III.	IV.	V.	VI.	Total.	Ult. rost. jt.	Siph.	Cauda.	Hind tarsus II.
1 (Holotype)	2·18	0·45	0·27	0·26	0·12+0·38	1·63	0·13	0·28	0·16	0·11
		0·44	0·27	0·24	0·12+0·38	1·59		0·29		0·11
2 . .	1·90	0·36	0·23	0·21	0·11+0·35	1·41	0·13	0·27	0·13	0·10
		0·36	0·21	0·22	0·12+0·33	1·39		0·27		0·10
3 . .	2·04	0·38	0·26	0·24	0·12+0·35	1·50	0·13	0·28	0·15	0·11
		0·39	0·24	0·21	0·12+0·35	1·46		0·28		0·11
4 . .	2·15	0·44	0·29	0·26	0·14+0·39	1·69	0·14	0·30	0·16	0·11
		0·43	0·28	0·26	0·12+0·41	1·67		0·32		0·11

Alate viviparous female.—Head smooth, dark, sclerotic; lateral frontal prominences distinct, but projecting only slightly further than the median ocellus. Cuticle wrinkled but not spinulose. Cephalic hairs up to 23μ, but with a smaller apical expansion than in the apt. viv. fem. Antennae three-quarters to seven-eighths body length, uniformly dark sclerotic, imbricate, III with 22–28 circular or slightly oval secondary rhinaria arranged irregularly over its whole length, IV with 0–4 on basal half, V with 0. Antennal hairs up to 10μ. Rostrum with apical joint very slightly longer than second joint of hind tarsus, with 4–5 hairs in addition to the preapical pairs. Abdomen with a conspicuous dorsal sclerotic pattern as follows: tergite 1 with an irregular row of small dark spots along fore margin and a narrow dark band, broken in the middle, along hind margin; a very small marginal sclerite on either side, each bearing a single hair, and with or without a tubercle.

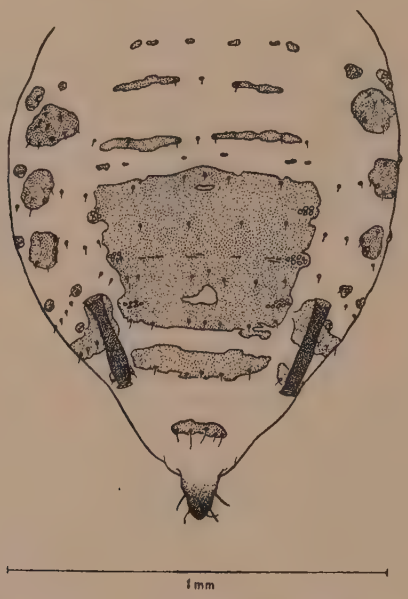

Fig. 2.—*Lipaphis matthiolae* sp. n., alate viviparous female; dorsal abdominal sclerotic pattern and chaetotaxy.

Tergite 2 as tergite 1, but the marginal sclerites of this and of 3 and 4 much larger, subcircular, spinulose, each with 4–7 hairs and one very small tubercle. Median sclerotic bands on 3–6 coalescing to form a fairly regular quadrangular shield which reaches to and encloses three groups of "Muskelplatten" along either lateral margin. Antesiphuncular sclerites very small, each with one hair and a tubercle; postsiphuncular sclerites large, L-shaped, extending from base of siphunculus downwards to ventrad of the stigmata, spinulose on dorsal half, with 3 hairs and no tubercle. Tergite 7 with an irregular broad spinulose band, in some specimens coalescing with marginal sclerites which bear the stigmata, with 7–8 hairs and sometimes a single minute median tubercle. Tergite 8 with a short transverse sclerotic band, with or without a median tubercle, and with 5–7 hairs. Stigmata reniform with thickened anterior margin. Subgenital plate with 2–5 hairs on anterior half and 7–9 along posterior border, all hairs acute. Siphunculi dark, sclerotic, the basal half narrow with faint annular corrugations, the distal half expanded and smooth, with a very slight constriction bearing a few transverse striae behind the flange. Cauda dusky, bluntly triangular, with 4–5 lateral hairs and 1 median dorsal. Legs with femora dark on distal

half to two thirds, more or less heavily imbricated, apices of tibiae and whole of tarsi dusky, remainder pale. Tibial hairs stout and spiny, especially towards the apex of the joint. Hairs on first tarsal joints as in apt. viv. fem. Wings normal aphidine.

Measurements of Alatae (millimetres, except rhinarial numbers).

	Body length.	Antennae. III.	IV.	V.	VI.	Total.	Rhin. III.	IV.	Ult. rost. jt.	Siph.	Cauda.	Hind tarsus II.
5	2·30	0·50	0·30	0·30	0·12+0·44	1·71	25	1	0·13	0·26	0·13	0·11
		0·51	0·30	0·30	0·13+0·44	1·73	25	2		0·27		0·11
6	2·47	0·51	0·32	0·33	.	.	24	0	0·13	0·28	?	0·11
		0·54	0·32	.	.	.	22	1		0·29		0·12
7	2·23	0·50	0·38	0·30	0·13+0·46	1·94	24	0	0·12	0·27	0·15	0·11
		0·51	0·36	0·32	0·14+0·47	1·97	28	4	0·12	0·27		0·11

Types: Holotype and paratypes in the British Museum; paratypes in D. Hille Ris Lambers' collection.

England: Northumberland, Whittingham, on stocks (*Matthiola* sp.) under glass, 8.xii.1936 (*R. A. Harper Gray*).

Notes: At present this species is known only by the seven specimens forming the type series and by five specimens collected by Dr. I. Thomas on *Arabis alba* in North Wales in 1939. The apterae resemble closely the type species *erysimi* Kltb., differing mainly in the spinulose cuticle of the head and the longer and more slender ultimate rostral joint. The alatae, however, are strikingly unlike the type species and other members of the genus in possessing a solid quadrangular dark dorsal patch on the abdomen, and dark siphunculi distinctly swollen on the distal half.

Acknowledgments.

My sincere gratitude is due to Dr. D. Hille Ris Lambers for supplying a large part of the material on which the revision of this genus is based, and for much valuable advice and criticism. I am indebted also to Dr. F. P. Müller for his help in sending specimens and information, and to Dr. I. Thomas for permission to examine material in his collection.

Postcript.

Through the kindness of Mr. F. H. Jacob, I received on 1st May, 1954, a sample of live material of *Lipaphis matthiolae* sp. n., infesting *Arabis alba* in the University gardens, Bangor, which enables me to add the following brief colour notes.

Apt. viv. fem.—Antennal joints I, II, and base of III almost colourless, remainder grey to black. Head very pale grey, pulverulent. Eyes black. Body medium to dark green or bluish-green, with a very slight pulverulence, absent in older individuals. Siphunculi pale greyish, darker at tips. Legs pale grey-green with apices of tibiae darker. Tarsi black. Cauda pale greyish. Ultimate rostral joint black.

Alate viv. fem.—Antennae, head, eyes, thorax, abdominal markings and siphunculi black. Remainder of abdominal dorsum and whole of venter greenish grey, pulverulent.

Cauda yellowish grey. Basal third of femora and most of tibiae very pale greenish or almost colourless. Remainder of femora, bases and apices of tibiae, and tarsi black. Ultimate rostral joint black.

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Book Notices.

The World of Bees. By Gilbert Nixon. 8vo. London (Hutchinson), 1954. Pp. 214, 16 pls. (1 col.). Price 12*s.* 6*d.*

This work by a leading specialist in the Hymenoptera is written in easy non-technical language designed to appeal to the enquiring layman. The whole world of bees—solitary bees, bumble bees, stingless bees, as well as the the honey bee—is covered.

The twenty-three chapters into which the book is divided cover their development, courtship, nest making, care of the young, social life, pollen-collecting "language" and "dances," their sense of smell and taste and ability to recognise colours. Their activities are decribed and many of the questions which puzzle the ordinary observer are answered.

The illustrations by Arthur Smith which are included in the work are of a very high standard.

Bees to the Heather. By Stanley B. Whitehead. 8vo. London (Faber and Faber), 1954. Pp. 96, pls., text illus. Price 12*s.* 6*d.*

This book is intended to provide an up-to-date and informative guide to this branch of apiculture, and is the first work specialising in heather honey production. The seven chapters deal with the best types of hives and equipment, the preparation of bee colonies for heather, their transportation, management and return, and the special properties of heather honey.

A guide to the heath and heather areas of Great Britain forms one of two appendices to the book, the other giving technical data and measurements of hives best suited to heather honey production.

THE ORIGIN AND DESCENT OF THE ORDER ODONATA BASED ON THE EVIDENCE OF PERSISTENT ARCHAIC CHARACTERS.

By Lt.-Col. F. C. Fraser, I.M.S.(retd.), F.R.E.S.

In a "Prodrome for a manual of the Dragonflies of North America" (1951, *Trans. Amer. ent. Soc.* **77** : 21–62) Professor James G. Needham recapitulates the arguments for pretracheation of the wings of insects and the probable derivation of the Order Odonata from large, densely-veined winged ancestors. In the course of this paper he makes some very critical remarks about my late colleague, Dr. R. J. Tillyard, as well as some scathing criticism about the work of Dr. Clarence H. Kennedy, myself and others; Dr. Frank M. Carpenter, who shares our views, has for some reason escaped criticism. Since Needham alludes to me as the foremost of Tillyard's disciples, and Tillyard is no longer here to defend his theories I feel obliged as his disciple to answer for him.

Tillyard, as is generally known and substantiated in his *Biology of Dragonflies*, at one time held the same views as now held by Needham, that is, that the Odonata had descended from broad-winged and densely veined ancestors more like the present day Anisoptera than the slender, simply-veined winged Coenagrions. He argued that the latter were the end-product of evolution brought about by a process of aesthenogenesis and a great reduction of their venation. At a later date he performed a complete *volte face* and came to regard the Coenagrions as the primitive ancestors of the Anisoptera as well as of the higher forms of the Zygoptera of recent times. Tillyard, however, always insisted that if he found a theory which fitted the facts better than one held previously, he had no hesitation in jettisoning the latter even if his reputation stood to suffer, which I regard as the hall-mark of an eminently scientific mind. It is of this reversion of his ideas, together with some vacillations in his interpretations of venation, that Needham is so scathing.

However, I am able to state that Tillyard had changed his ideas on the phylogeny of the Odonata long before the discovery of *Kennedya mirabilis*, although he had kept obstinately silent on the fact, due, I fear, to a feeling of frustration that so simple a clue as the persistence of the two primary antenodal veins, not only in the higher forms of the Zygoptera but also in most of those of the Anisoptera, had escaped his notice. At a meeting at the British Museum, with the late Herbert Campion and myself, Tillyard gave a long dissertation on the supposed anisopterous derivation of the Odonata and dealt ruthlessly with arguments put forward by Campion and myself. At the end of it, I took out specimens representative of the genera *Aeshna*, *Cordulegaster*, *Gomphus* and a *Rhinocypha* and ranged them alongside one of the commoner British *Coenagrion*. Pointing to the two strong antenodal veins in the wings of all the four former specimens, I asked him to compare them with the two antenodals of the *Coenagrion*, and inquired whether from the same relative position in the wing and to each other he did not think that the antenodals of all these four were homologues of those in the *Coenagrion* wing. After studying the wings for

some minutes he remarked that they appeared to coincide but, as there was no evidence that such simple-veined *Coenagrion*-like dragonflies had ever existed prior to recent times, it was obvious that the homology was more apparent than real. Nevertheless, it was evident that his faith had been undermined and I feel sure that he nursed this new theory from then until a later opportunity arose for presenting it from a different angle. It is a curious fact that Tillyard never drew attention to the significance of the " strong antenodals " in so many of the anisopterous genera and their apparent homology with those of the Coenagriidae although it would have enormously strengthened his new theory. It is still more significant that Needham remains entirely silent on the same subject. Nowhere in his " Prodrome " has he mentioned these veins and I can only surmise that he feels that to do so would refute his own long-cherished theory.

Needham, recapitulating his theories, applies himself to an analysis of *Kennedya mirabilis* Tillyard, which formed, as he says, the basis of Tillyard's system. He questions whether it was as primitive as Tillyard and says, " Clearly it is Zygopterous and Coenagrionine," and then goes on to show that the veins are the same, although somewhat differently disposed. The greatest difference is in the presence of the remnant of CuA at the base of the wings, which, he (Needham) calls " spurious," although it occurs regularly both in the Protozygoptera and Protanisoptera ! For this same vein he gives the extraordinary explanation that it is the anal vein which has been pushed under the base of the stronger cubitus by pressure in the basal hinge formation of the wing. This he has deduced from a single crude drawing of a nymphal wing made by a former student many years ago, but supported by a statement that it is not uncommon to find a similar dislocation of the anal vein in nymphs of *Libellula*, but that it slips back into place at ecdysis. He does not explain why it failed to slip back into place in the numerous imaginal wings known of the Protozygoptera and Protanisoptera, as well as in the tens of thousands of wings of imagines of recent Odonata which have been examined and in which no such formation has ever been noticed. It is indeed astonishing that such a dislocation should persist in 100 per cent. of fossil Coenagrions whilst it is absent in 100 per cent. of recent Odonata. Such an explanation can be dismissed as fantastic and untenable. Nor is the presence of CuA the only difference which prevents *Kennedya* from being regarded as a modern rather than an extremely primitive insect. Needham has closed his eyes to the following differences : the primitive zigzagging of the main veins Mii (Riii) and Rs (IRiii) in the fossil wing, the paucity of postnodals and their failure to align themselves with the crossveins immediately below them, which is so invariable a feature in recent Coenagrions. Nor does he mention the unbraced pterostigma or the absent base to the discoidal quadrangle. He thinks that it is most unlikely that the vein CuA has disappeared, but not only is this vein absent in the Odonata but MP also, a complementary pair of plus and minus or convex and concave veins. In the orderly corrugation of a wing, the loss of one vein must perforce be accompanied by its opposite or complementary one, or the wing would be seriously weakened at that level. The great and increasing use of corrugated fabrics now-a-days is proof of the mechanical efficiency of corrugation, or " fluting " as he prefers to call it ; but Needham does not appreciate its strength. He says, " It is a poor way to stiffen a wing " and regards it as primitive because simpler

ways and plans of support have prevailed among the higher insects and have yielded the best fliers. As an instance of the weakness imparted to a wing by fluting he mentions the Ephemeroptera, which are all weak flyers. But if the wings were deprived of their fluting their capacity for flight would be negligible. It is surprising, after reading this disparaging statement on fluting, to look at the fine wing depicted by Needham in this same paper and to note that, not only is corrugation present between the main veins, but has extended lavishly to all open spaces in between. And, on the same wing, the fine curved strong planate veins Rspl and Mspl running beneath MA (Miv) and IRiii (Rs) can be observed : Needham has had to admit that these are not pretracheated and that they even run across strong tracheal trunks, as in the case of his Rs trachea. To me it seems obvious that, in the course of some millions of years, these planate veins will be eventually tracheated by obtaining their tracheal supply from branches of neighbouring pre-existing tracheae, and in those far off days authors will perhaps be making the same erroneous deductions of the persisting " crossings " as has Needham, so that history may well be preparing to repeat itself. Needham also says, " The complete dominance of the hypodermis in *the final shaping* of the venation pattern is seen . . . in the forming planates *independently of the tracheae* across strong tracheal branches." Here therefore he openly admits the failure of pretracheation, but also falls into another serious error in speaking of *the final shaping* (the italics are mine), for there is no finality in evolution. In the present case, it cannot be called final since the planates have not yet acquired their tracheae as they surely will do if given time and eternity.

On p. 58 of Needham's paper there is a paragraph which shows that he has completely misunderstood my theories on the formation of " bridge-veins." He says, " Fraser also noted the looseness of the proximal end of the bridge (the Lestine bridge-vein) where it turns forward in most Odonata (backward in a few, mostly fossil forms) to make contact with vein M within the middle fork (Mf) ; and by a masterly piece of circumlocution seems to have convinced himself that this looseness should not be considered evidence of the secondary nature of the bridge !" Far from this being the case, the whole purport of my paper was to show that *bridge-veins are of a secondary nature.* This could not be clearer, because at the end of the second paragraph on p. 58 I state : " The failure of IRiii (Rs) to make contact with the basal veins in some 5 per cent. of the wings clearly implies that Needham was correct in, at least, the latter half of his theory relating to the formation of the ' bridge-veins '." Again, at the top of p. 59, " . . . in my opinion, this is sufficient proof that IRiii (Rs) never originated from a basal source but extended inwards from a peripheral one." As the wing originates from a basal outgrowth, peripheral items such as this bridge-vein must perforce be of a secondary nature. The failure of this bridge-vein to obtain continuity with a basal structure is absolute proof of its secondary peripheral origin. Arising from this misunderstanding it becomes necessary to define a bridge-vein. " A bridge-vein is a secondary structure and represents the renewal of the growth of an intercalated vein towards the base of the wing (Lestine bridge) or the reconstruction of a break in a formerly existing vein (anal bridge) after a prolonged static period at a constant point, which latter is defined by the presence of an oblique vein across which the vein received its tracheal supply from one of the neighbouring veins."

I come now to a restatement of the phylogeny of the order Odonata which Needham still maintains originated from anisopterous-like ancestors, and it is ironical to find that one of his most classical discoveries in the venation of the Odonate wing has given us a key to the problem. I refer to the short cross-vein Ac (anal-crossing) at the base of the wing *which is found constantly throughout the whole order Odonata*, and I will allow Needham himself to stress the great importance of this vestigial character. On p. 58 of his " Prodrome " he says, " Fraser has strayed so far from the Neo-Adolphian fold as to be willing to look at wing tracheae. And looking at the anal trachea, he has seen that its circuitous course forward against and along the cubital trachea and back again down the anal crossing to the original level, is but a detour, its former road being blocked by pressure from the rear. And he has seen that the crossing Ac, has added an enduring element of strength to the wing base. He writes: '*The phylogenetic importance of this short cross nervure Ac cannot be exaggerated.* Its presence in modern Odonata shows not only the path the anal trachea has taken, but also shows that the base of the wings has at one time gone through a process of great reduction, the process having been responsible for driving the trachea inward.' This statement is good morphology.'

I have nothing to add to or deduct from this statement. The very fact that the vein Ac is present throughout the whole of the Anisoptera is clear proof that these broad-winged forms have undergone in the past a great reduction of the wing base sufficient to drive the anal trachea inwards on to the cubitus, and the posterior border of the wing right up to the anal vein at its most basal portion. Here, then, we have a narrow petiolated Coenagrionine or Zygopterous ancestor common to the whole Order Odonata. For further proof of this ancestry and in order to follow the evolution of the Order up to and beyond its dichotomy into the two suborders Zygoptera and Anisoptera, it will be useful to take some other ordinal characters and, by tracing them through the various families from the earliest known forms, to discover if or how they coincide with the evidence afforded by the anal cross-vein Ac. For this purpose I have taken the ovipositor, whether complete and functional, or vestigial; the two primitive antenodal veins, as these are present from the earliest times; the eyes separated or confluent, the former being an extremely archaic character; and, lastly, the recession of the two longitudinal veins IRiii (Rs) and Riv, which are first found arising from points proximal to the nodus in the Lestidae and thus sign-post the great dichotomy of the order into the Zygoptera and Anisoptera.

In constructing a geneologic tree I have made the accompanying coloured diagram, each character being represented by a different colour. The heavy *black* line represents the cross-vein Ac, because this character is found throughout the whole Order and the black line therefore follows all the ramifications of the tree and forms a useful scaffolding on which to impose the colours.

Eyes Separated or Confluent.

For this character I have adopted *green* as the representative colour. We do not know for certain whether the eyes were separated or not in the primitive Zygoptera but all probabilities suggest that the former condition prevailed, as it is found to-day throughout all the Zygoptera and has been carried over in some cases into the Anisoptera. Thus the green line will be found as representing the separated eyes right through and up to the Agriidae on the one hand and

extending to the Petaluridae, Gomphidae and, to a lesser degree, to the Cordulegasteridae on the other. In the latter family it may be found present in the female sex but absent in the male, a significant evolutionary fact when we consider that the former sex is usually more primitive than the latter.

Ovipositor Complete or Vestigial.

Yellow has been taken to represent the complete or functional ovipositor and, as this character is common to the whole of the Zygoptera, the yellow line runs right through, paralleling the green line, to the Agriidae. On the other hand it is found to be carried into the Anisoptera only in two families, the Aeshnidae and Petaluridae. For this reason it seems factual that the two families are more primitive than the Gomphidae which, probably on account of their separated eyes, have hitherto been considered as the more primitive. Weighing the two characters in regard to their respective importance, we find that, whereas the ovipositor is either complete or vestigial, there being no in-between stages, the degree of separation of the eyes is wide, especially if we compare the various genera throughout the Cordulegasteridae and Libellulidae. I am of opinion that there can be no question as to which is the more important character of the two.

Primary Antenodal Veins Present or Absent.

Throughout the fossil genera of the Protozygoptera and the whole of the genera of the primitive Coenagriidae we find only two antenodal veins. After the dichotomy of the Order we find other antenodal veins appearing, at first a few but becoming steadily more numerous, but they are always of a weaker build than the two primaries so that the latter can always be readily distinguished. Moreover the additions are largely composed of costal and subcostal halves *which do not coincide ;* the primaries on the other hand are invariably in line. In the final stage the secondary antenodals come into alignment and exhibit a gradual thickening from the nodus to the base of the wing so that the two primary veins become merged and lose their identity in a forest of similar veins. In the diagram, *red* represents the primary antenodals and is found to run right through the Coengarions and to branch off through the Amphipterygidae to the Chlorocyphidae and Polythoridae where it ends. Thus the Epallagidae, Hetaerinidae and Agriidae were found to be the most modern of the Zygoptera. On the other hand, the red line is carried into the Anisoptera, extending into all the families save the Libellulidae but considerably weakening in the Corduliidae. Thus the Libellulidae were found to be the most highly developed and modern of all present-day Odonata, lacking the separated eyes, the complete functional ovipositor and the primary antenodals. It will be appreciated that all these characters, including the vein Ac, run alike into the two suborders and so give no evidence of the time and the place where the dichotomy of the two suborders occurred. It became necessary therefore to employ a fifth character of more recent date. For this the recession of the two longitudinal veins IRiii and Riv to a point proximal to the nodus was the obvious choice and for which the colour *blue* was added to my diagram.

Recession of IRiii and Riv to a Point Proximal of the Nodus.

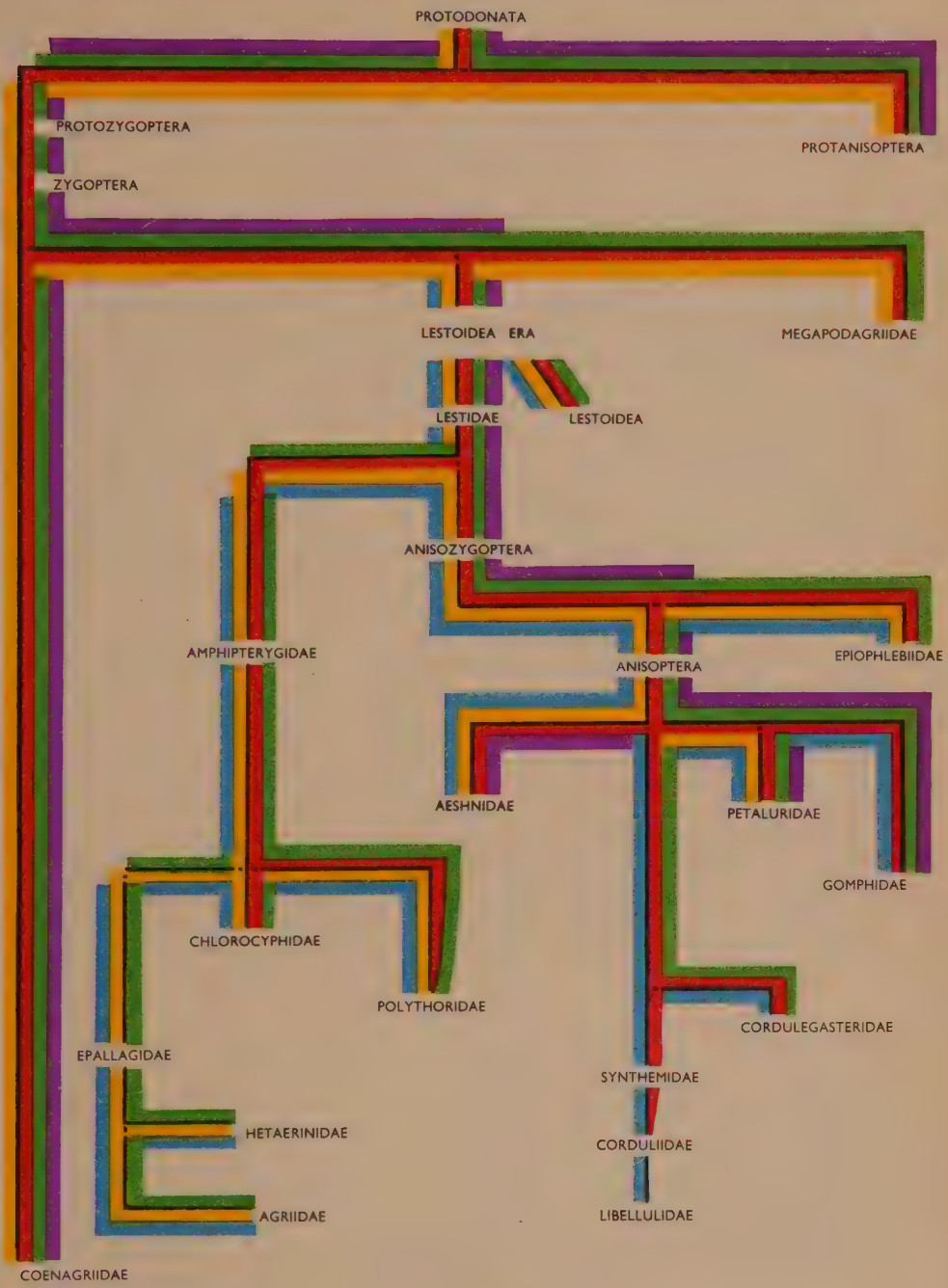
Although there was a general tendency for the origins of the longitudinal veins to travel proximally towards the base of the wing and, in the majority of genera, Riv had already extended to a point proximal of the nodus, the stage at which both IRiii and Riv take origin from a point nearer to the arculus than the nodus appears quite abruptly in the Lestidae and from then onwards is found without a break throughout both the Zygoptera and Anisoptera. Here, then, we find our point of dichotomy, the only exception being the genus *Lestoidea* Tillyard, which must have preceded the Lestidae but left the main stem of the primitive Zygoptera before it continued as a side branch to the Megapodagriidae. This peculiar genus appears to have hesitated at the parting of the ways, adopting the recession of the two main veins chosen by the Lestidae on the one hand, and the accessory sectors, genitalia and braceless pterostigma of the Megapodagriidae on the other. It chose the middle path and has journeyed, an enigma, in solitude through the countless years. Arrayed against all the forces of nature which go to ensure the survival of the fittest, we can only speculate as to why this weak and insignificant creature has survived.

Other characters may be considered in tracing the evolution of the Odonata, such as the brace of the pterostigma, which is found to be lacking throughout the whole of the Megapodagriidae, Amphipterygidae and Agriidae of the Zygoptera on the one hand, but preserved in the Anisoptera, with the exception of the Cordulegasteridae, Synthemidae, Corduliidae and Libellulidae, on the other. The evidence afforded by the five characters already dealt with seems to me irrefutable and points to an origin of present-day Odonata from a narrow, petiolated winged form, as represented by the fossil Protozygoptera, and their present-day progeny, the Coenagriidae.

Professor Needham fights hard to preserve his cherished theories but it was his monumental work on the nymphal tracheae that laid the foundation on which the new theories were built by Tillyard, and further elucidated by myself. Needham's work on the tracheae showed the tortuous windings which the veins have taken during their evolution; his explanation of the "oblique cross-veins" revealed the static periods in the growth of the main longitudinal veins; his "bridges," Ab and the Lestine bridge, the renewal of the growth in these veins; and lastly, his vein Ac, the fact that the wing had undergone great contraction at the base and, as a corollary, every wing which possessed that vein had evolved from a petiolated wing. Without such knowledge, it would have been impossible to formulate and elucidate the modern theory; it was by the flood of light which his work shed on the problem that we, his students, saw and plotted the evolutionary path pursued by the Odonata. Tillyard, and others like myself who accepted his theories, are greatly in his debt.

PLATE 1.

Genealogic tree to demonstrate the descent of recent Odonata from the primitive Protodonate. Five ordinal characters are shown, represented each by a different colour as shown at the foot of the plate. By following the lines of colour, the incidence, distribution and loss of each character can be easily traced from Lower Permian fossil species to the most recent.


PROTODONATA
PROTOZYGOPTERA
PROTANISOPTERA
ZYGOPTERA
LESTOIDEA ERA
MEGAPODAGRIIDAE
LESTIDAE
LESTOIDEA
ANISOZYGOPTERA
AMPHIPTERYGIDAE
ANISOPTERA
EPIOPHLEBIIDAE
AESHNIDAE
PETALURIDAE
GOMPHIDAE
CHLOROCYPHIDAE
POLYTHORIDAE
CORDULEGASTERIDAE
EPALLAGIDAE
SYNTHEMIDAE
HETAERINIDAE
CORDULIIDAE
AGRIIDAE
LIBELLULIDAE
COENAGRIIDAE
... ... Primary antenodals present.
... ... Fully developed ovipositor present.
... ... Eyes separated.
... ... Pterostigma with brace.
... ... IRiii and Riv arising proximal to arculus.
The black line indicates the Anal crossing (Ac), the most primitive character, which is found throughout the Order.

THE GENUS *CHIASTOCHAETA* POKORNY (DIPTERA: ANTHOMYIIDAE).

By J. E. Collin, F.R.E.S.

A generic name *Chiastocheta* was proposed by Pokorny in 1889 for a species found by him in the flowers of *Trollius europaeus* growing on the "Schneeberg" of the Austrian Alps, and which he identified as being the *Aricia trollii* of Zetterstedt.[1] Kowarz in 1893 accepted the genus, emending the name to *Chiastochaeta*, but Mik in 1895, when giving an account of the biology, did not consider the genus distinct from *Chirosia*. In this he was followed by Stein in Kertesz' *Katalog*, where *Chiastochaeta* is given as a synonym of *Chirosia*, though subsequently (1916) Stein accepted the genus as distinct.

Chiastochaeta differs from most of the Anthomyiidae, and agrees with *Chirosia* in having the frons equally wide in both sexes, but has an antero-ventral spur only to hind tibiae, and that short and stout, whereas *Chirosia* has two longer spurs, one antero- and one posteroventral; moreover the larvae of *Chirosia* are miners in the fronds of different genera of Filices, while those of *Chiastochaeta* all live in the flower-heads of *Trollius*.

Species of *Chiastochaeta* are rather small flies with head rounded in profile, flat below, but back of head considerably puffed out; cheeks and jowls narrow; face short, rather concave, with actual front rim of mouth-edge produced; antennae very short, third joint not much longer than second, arista only microscopically pubescent; frontalia with a pair of cruciate bristles in both sexes, often reddish-yellow in front; occiput with 3–4 rows of short bristles except on a wide space behind vertex; mouth-edge at sides with a single row of bristles which become longer behind. Thorax with only three pairs of strong postsutural dorsocentral bristles; sternopleurals 2 : 2 but lower pair short and fine; scutellum usually bare beneath but occasionally with a few tiny hairs beneath tip. Chaetotaxy of legs apparently not very constant and differing in the sexes, middle tibiae with bristles, at least in females, usually 0, 1, 2, 2 (commencing with antero- and finishing with posteroventral), hind tibiae usually with four anterodorsal and three somewhat longer posterodorsal bristles. Costa usually with hairs below the lower row of small spines (at any rate about middle of costa), but not in *rotundiventris*. Anal vein extending to wing-margin.

Until 1911 only one species of *Chiastochaeta* had been recognised, but in that year Schnabl and Dziedzicki described a second species (*C. lacteipennis*) from a single male taken in Poland, and gave figures of the male genitalia of this and a species they recognised as *C. trollii* Zett. No mention was made of the habits of *lacteipennis*, and no other record of its occurrence has been published until quite recently; as a consequence all specimens of *Chiastochaeta* found in or about the flowers of *Trollius europaeus* have always been labelled "*C. trollii* Zett." In 1943 Karl described a third species of this genus, while since this paper was drafted (and fortunately before it was printed) Dr. Hennig of Berlin published a revision of the species.

The first record of the capture in Britain of species of this genus was that of Mr. A. A. Dallman in the *North-Western Naturalist* for December, 1931.

[1] It will be noted later, under *C. macropyga* Hen., that Pokorny certainly included at least this species under his *trollii* Zett.

He found specimens in the flowers of *Trollius* growing in Wales (Carnarvon and Denbighshire), and some of his specimens sent to me by Mr. H. Britten of Manchester were returned as *Chiastochaeta trollii* Zett. In June, 1933, when I found *Trollius* growing on the Inverness-shire bank of the Spey at Grantown, I secured a long series of what I thought was *C. trollii*, and was surprised upon examining them to discover that I had taken specimens of three distinct species. In the same year Mr. Britten and Mr. C. A. Cheetham found that the genus occurred in Yorkshire, and in 1934 in company with the latter I visited some of these localities. An examination of the material obtained by all of us resulted in the discovery of two additional species, while a small amount of Continental material in my possession included a sixth distinct species.

It is very difficult to associate the sexes correctly in cases such as this where the males are separated mainly by sexual characters, and any number up to five distinct species may be found on the same patch of *Trollius* flowers. The publication of this paper was delayed in the hope that a series of specimens taken *in cop.* might be forthcoming, then the second world war intervened, and this hope has not since been fulfilled. All the species have the habit of hiding themselves in the chamber formed by the incurved petals of the flower they frequent, and probably copulate when so hidden. The only females which can be associated with males with any degree of confidence are those of *dentifera* and *rotundiventris*.

Mik in 1895 recorded that one species (it is not known which) lays its eggs on the unripe seed-heads of *Trollius*, the larva boring its way into the seeds and living upon them; when full grown it leaves the seed-head and pupates in the earth. It appears probable that all the species have a similar life-history.

Superficially the adults of all species are very much alike, and apart from small differences in leg chaetotaxy, differ chiefly in structure of male genitalia and female ovipositor; consequently the best "type" of any new species is a satisfactory drawing of the genitalia. In the males the genital differences sufficiently affect the shape of the end of the abdomen to render it possible to recognise the various species without dissection, but this is not the case in the females. These genital differences in both sexes are so profound that there can be no doubt that the species are genuinely distinct, and remain so in spite of their very intimate association with one particular plant. The question of what circumstances were necessary to produce the evolution of these different species from a common ancestor offers an interesting subject for speculation.

Table for distinguishing males of *Chiastochaeta*.

1 (2). Jowls at narrowest part below eyes narrower than palpi. Abdomen broad, and viewed from the side with very large hypopygium having a mesolobe of very distinctive shape. Prehypopygial tergite brightly shining at sides.
(Drawings in figs. 1, 2 and 3 marked "*d*")
1. **rotundiventris** Hennig

2 (1). Jowls below eyes at least as wide (usually much wider) than palpi. Abdomen not so broad, nor sides of prehypopygial tergite particularly shining.

3 (4). Lobes of last sternite each with a blunt *preapical* projection pointing downwards (fig. 2*c*).
(Drawings in figs. 1, 2 and 3 marked "*c*"). 2. **dentifera** Hennig

4 (3). No such preapical projection from lobes of last sternite.

5 (6). Hypopygium viewed from the side comparatively small and scarcely projecting beyond end of prehypopygial tergite (fig. 2*e*).

(Drawings in figs. 1 and 2 marked "*e*")

3. **schnabli** n. n. (*trollii* S. & D. *nec* Zett.)

6 (5). Hypopygium large (or very large) projecting in lateral view as a rotund mass beyond end of prehypopygial tergite.

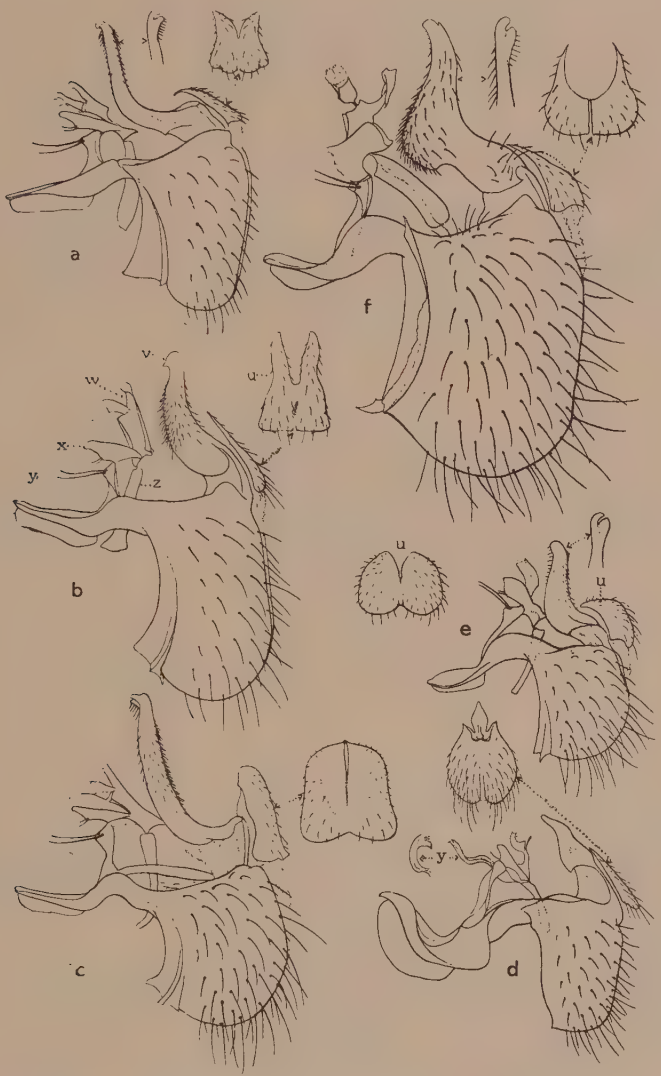


Fig. 1.—Male genital details of species of *Chiastochaeta :* (*a*) *trollii* Zett. ; (*b*) *setifera* Hennig ; (*c*) *dentifera* Hennig ; (*d*) *rotundiventris* Hennig ; (*e*) *schnabli* n. n. ; (*f*) *macropyga* Hennig.

In (*b*) *setifera*, u = mesolobe, v = paralobe, w = penis, x and y = superior and inferior gonapophyses, and z = apodeme of penis.

7 (8). Hypopygium not so very large (fig. 2*a*). Inner (or in profile lower) margin of lobes of last sternite markedly concave, resembling those of *rotundiventris*.
(Drawings in figs. 1 and 2 marked "*a*") . . . **4. trollii** Zett.

8 (7). Hypopygium larger (fig. 2*b*). Inner (or lower) margin of lobes of last sternite practically straight.
(Drawings in figs. 1, 2 and 3 marked "*b*") . **5. setifera** Hennig

The continental *C. macropyga* Hennig resembles *setifera* but has a still larger hypopygium with differently shaped mesolobe and internal apophyses. (Drawings in figs. 1 and 2 marked "*f*").

A reference to *C. lophota* Karl will be found under the description of *C. schnabli*.

The males of *setifera* and *schnabli* have 2–3 small anteroventral bristles on hind tibiae standing out more or less distinctly (particularly so in *setifera*) from among the usual small setulae there present; in the other three British species these bristles are absent, but in *dentifera*, and apparently also in *lophota*, the usual anteroventral setulae are particularly long and numerous, and rather less so in *rotundiventris*. In *schnabli* there is often no anterodorsal bristle to middle tibiae, while the posteroventral and posterodorsal bristles are also quite short. It is unfortunate that these distinctions apply to males only.

1. *C. rotundiventris* Hennig (1953).

This species, in addition to the characters mentioned in the table, has rather more numerous and stouter, short outstanding bristles on front margin of disc of thorax than is usual. Mesolobe of hypopygium of particularly distinctive shape (fig. 1, *d*), and inferior gonapophyses (*y*) completely different from those of any other species. Costa of wing practically bare beneath. Scutellum usually with a few minute hairs beneath tip. The rather short female ovipositor is also very distinctive (fig. 3*d*).

Specimens examined from Inverness-shire (near Grantown), Perthshire (Loch Tay), Yorkshire (Austwick and Helwith), Carnarvon (Pontypant) and Cumberland (Alston). It has been returned to correspondents by me under the MS. name of *lativentris*.

2. *C. dentifera* Hennig (1953).

This species has all bristles longer than usual, and the prehypopygial tergite of male usually has a *shining* black front margin. The details of male genitalia (fig. 1*c*), last sternite in male with a blunt projection to each lobe close to tip (fig. 2*c*), and female ovipositor much longer than usual (fig. 3*c*), are all very distinctive characters. Zetterstedt probably included specimens of this species under his *trollii* because he referred to the projection on last sternite in his description (see note under species 4. *trollii*).

Specimens examined from Inverness-shire (near Grantown), Perthshire (Loch Tay), Yorkshire (Austwick and Ribblehead), and Cumberland (Alston). It has been identified by me for correspondents as *C. trollii* Zett.

3. **C. schnabli** nom. nov. (*C. trollii* S. & D. *nec* Zett.).

This species would appear to have been unknown to Hennig who suggested (without being very happy about the synonymy) that *C. trollii* of Schnabl and Dziedzicki was the same as his own *dentifera*. This is certainly incorrect so

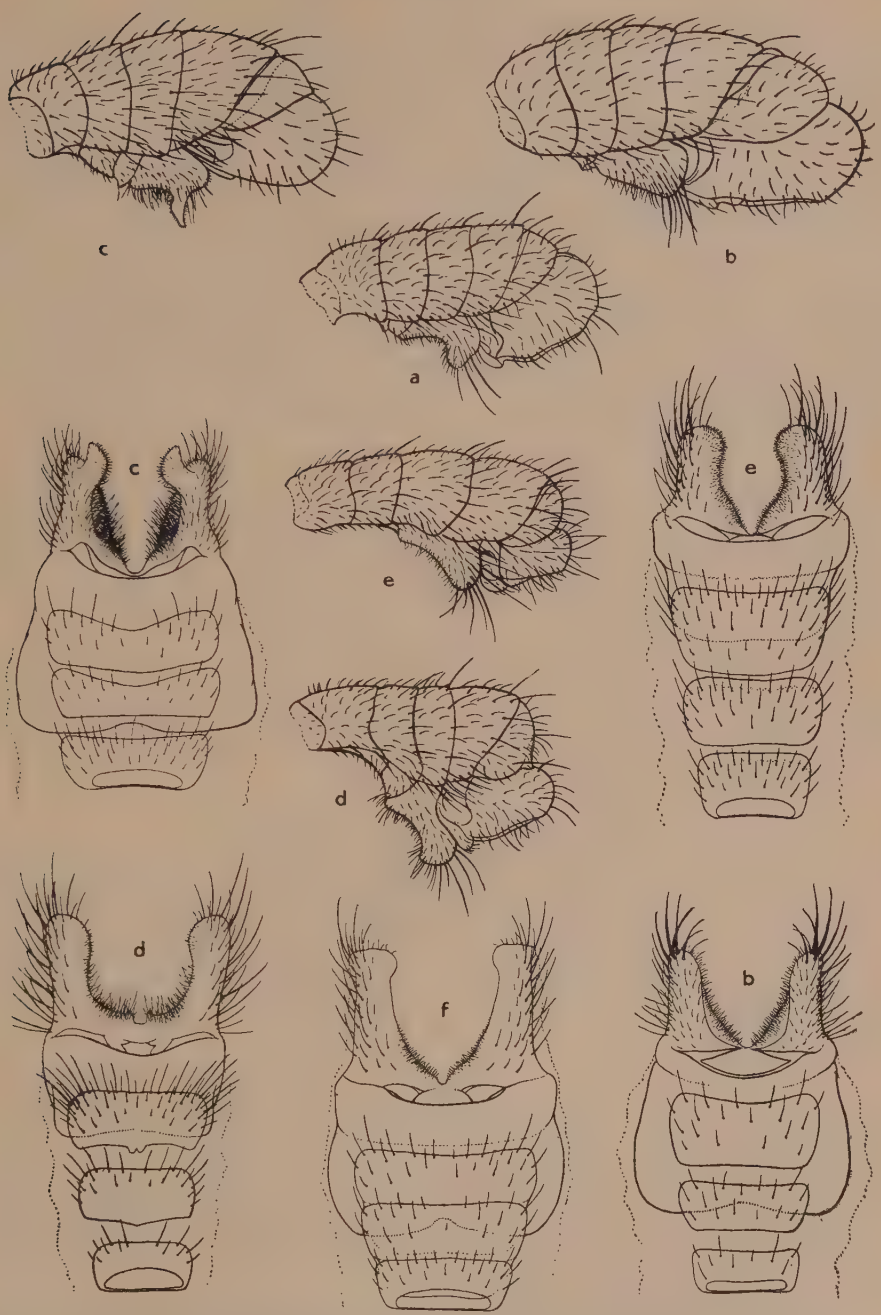


FIG. 2.—Male abdomen in profile and abdominal sternites of species of *Chiastochaeta :* (*a*) abdomen only of *trollii* Zett. ; (*b*) abdomen and sternites of *setifera* Hennig ; (*c*) *dentifera* Hennig ; (*d*) *rotundiventris* Hennig ; (*e*) *schnabli* n. n. ; (*f*) sternites only of *macropyga* Hennig.

far as our British specimens are concerned. *C. schnabli* has some resemblance, particularly in regard to shape of mesolobe, to *lophota* Karl, but the relative proportions of length of mesolobe to length of paralobes are very different, and this, coupled with the much longer anteroventral setulae on middle and hind tibiae in Karl's species, indicate a distinct species. I have taken *schnabli* in large numbers, and there is no variation towards such characters. According to Hennig the abdomen of the (apparently unique) type of Karl's *lophota* from which that author made his (not very satisfactory) drawing of the male genitalia, has been lost, but Hennig's suggestion that Karl's species was the same as that to which he himself had restricted the name of *trollii*, namely the *lacteipennis* of Schnabl and Dziedzicki, appears to be *most* improbable because Karl compared *lophota* with a species he recognised as *trollii*, and according to two males given by him to me, his *trollii* was *lacteipennis* S. & D. Moreover Karl stated that in *lophota* the paralobes (inneren Zangen) were " kräftiger " and " mehr beborstet " than in his *trollii*, which must mean two distinct species.

C. schnabli has a hypopygium comparatively small for this genus (fig. 2*e*), with a mesolobe of distinctive shape (fig. 1*e*, " *y* "). The bristles everywhere are shorter than in *dentifera*, and the front margin of prehypopygial tergite is not shining, while the very short (and often in other species hidden) sixth tergite which precedes it is unusually visible in *schnabli* and *almost entirely dusted*. The female (if correctly associated) has an arrangement of hispid patches on the penultimate segment of ovipositor (fig. 3*e*), strikingly different from that of *setifera* (fig. 3*b*).

Specimens examined from Inverness-shire (near Grantown), Perthshire (Loch Tay), Yorkshire (Austwick, Ribblehead, Lawkland, Malham and Helwith) and Durham (Teesdale).

4. *C. trollii* Zetterstedt (1845), *t.* Hennig (1953).

In the male genitalia the V-shaped mesolobe (fig. 1*a*) somewhat resembles that of *setifera*, but the paralobes, or lateral forceps, are uniformly narrow, much as in *dentifera*. The lobes of last sternite resemble those figured for *rotundiventris* and are therefore not separately figured, but when viewed from the side the lower margin of each lobe is still more concave, leaving the tip projecting downwards (fig. 2*a*), an imitation of the *preapical* process of *dentifera*. Scutellum occasionally with minute hairs beneath tip. I have not definitely recognised the female but believe it to have a very similar ovipositor to that of *schnabli*.

Specimens examined from Yorkshire (Austwick, Ribblehead, Lawkland, Malham and Helwith), Durham (Teesdale) and Cumberland (Alston). It has been identified by me for correspondents under the synonym of *lacteipennis* S. & D., and two males together with a female of *rotundiventris* and a female of *setifera* were given to me by Karl as specimens of *C. trollii* Zett. I had previously associated the name of *trollii* with Hennig's *dentifera* in which the lobes of the last abdominal sternite answer much better to Zetterstedt's statement of " appendicibus 2 parvis ventralibus suffultus."

Ringdahl in 1939 identified the female type of *Anthomyza inermella* Zett. (1938) as a *Chiastochaeta* and (obviously because he knew of no other Scandinavian species) as *Chiastochaeta trollii* Zett. (1845), which, if correct, would mean the latter name disappearing as a synonym. Hennig, while admitting that

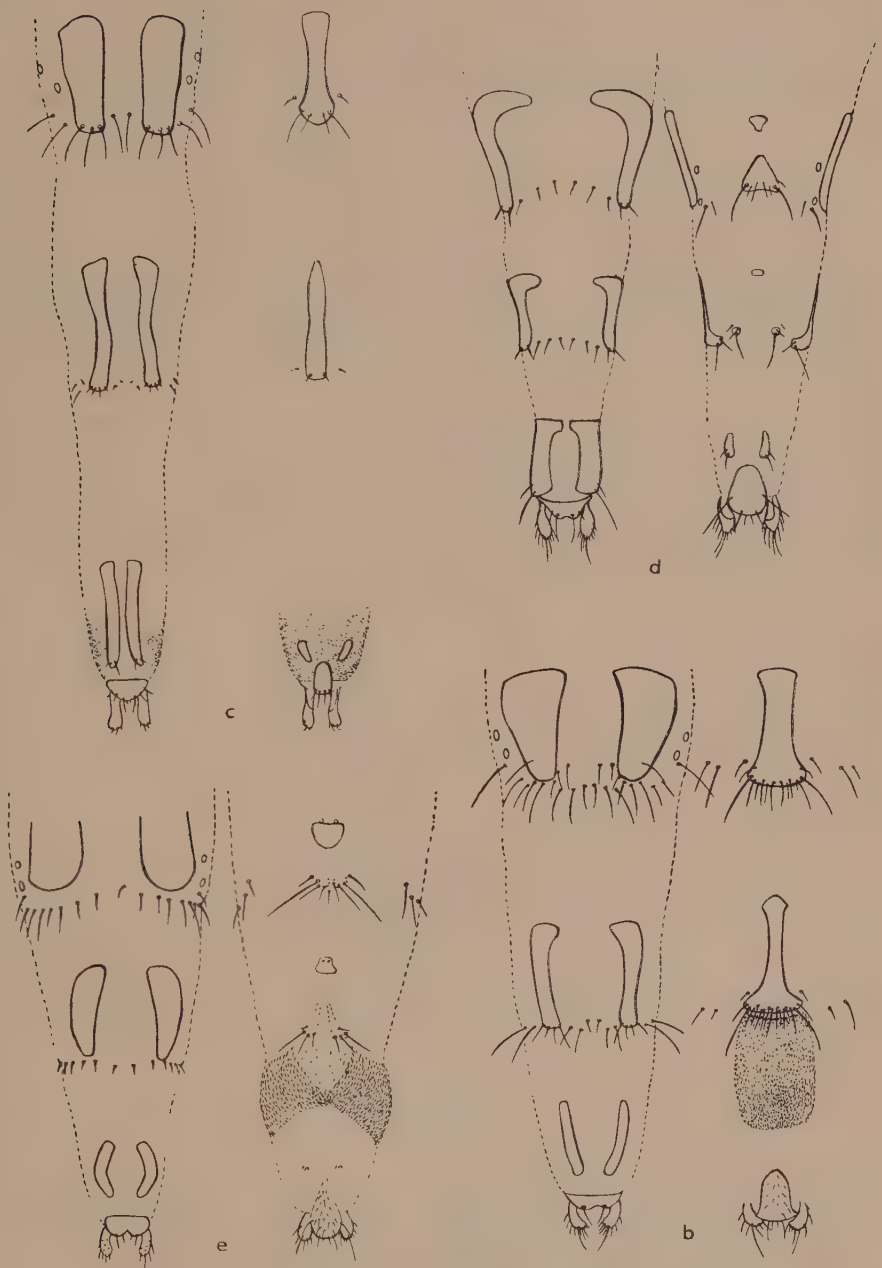


FIG. 3.—Dorsal (left) and ventral (right) views of female ovipositor of species of *Chiastochaeta :* (*b*) *setifera* Hennig ; (*c*) *dentifera* Hennig ; (*d*) *rotundiventris* Hennig ; (*e*) *schnabli* n. n.

females in this genus are at present unrecognisable, has accepted the synonymy. It is certain, however, that in addition to *trollii* there are other species of this genus in Sweden which were in 1939 unknown to Ringdahl (see below under *C. macropyga*), and this supposed synonymy should, therefore, not be accepted until the identity of *inermella* has been more satisfactorily established.

5. *C. setifera* Hennig (1953).

The evenly rounded hypopygium of the male of this species viewed from above is particularly smoothly blended with the previous segment, and is more densely dusted greyish than usual; in profile (fig. 2*b*) it is longer than in *trollii*, and the lower margin of lobes of last sternite is not so concave. The V-shaped end of mesolobe is longer than in *trollii*, and the lateral paralobes shorter and not so evenly slender, with end *not* bilobed but shaped like a bird's head (fig. 1*b*). The female (if correctly associated) may be known by the single, large, hispid patch on ventral surface at base of penultimate segment of ovipositor (fig. 3*b*).

Specimens examined from Inverness-shire (near Grantown), Yorkshire (Austwick, Helwith, Malham and Whiterock), Cumberland (Newtown Reigny Moss) and Carnarvon (Pontypant). It has been returned to correspondents by me under the MS. name of *C. genitalis*.

6. *C. macropyga* Hennig (1953).

This species, which has not so far been found in Britain, can at present be distinguished only by its remarkably large and distinctive male genitalia (fig. 1*f*). The abdomen viewed from above is rather like that of *setifera*, but the hypopygium so viewed is decidedly longer than the previous segment. The single specimen in my possession, and Zetterstedt's "Tarna" male mentioned below, have front of frons broadly yellowish, and middle tibiae with one posterodorsal and one posteroventral bristle (no anterodorsal bristle). The abdominal sternites are shown in fig. 2*f*.

One male was present in a collection from Kowarz under the name of *C. trollii* Zett., labelled "Schneeberg, 22.vi.87," and almost certainly one of those captured by Pokorny, the author of the generic name *Chiastochaeta*. There is also a male in Zetterstedt's collection under his *Aricia inermella* with locality label "Tarna" and therefore probably one of those recorded in *Dipt. Scand.* **14**: 6254. It is indeed quite possible that the type female of *inermella* will also prove to be *macropyga*; it is certainly unlike any female known to me.

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NEW CULICINI FROM THE KENYA COAST.

By Mrs. E. C. C. van Someren.

(*Division of Insect-borne Diseases, Medical Research Laboratory, Nairobi, Kenya.*)

Uranotaenia lucyae sp. n.

Edwards (1941) divides the Ethiopian *Uranotaenia* into four groups. This mosquito is very like *U. annulata* Theobald and *U. candidipes* Edwards of Group B, but is readily distinguished from these by having basal, instead of apical, pale bands on the tergites.

Female. Head.—Decumbent scales broad, flat and pale yellow with a small, slightly darker patch in the middle above; upright scales numerous and yellowish. Tori light brown and with a few short hairs and small brownish scales on the inner border; first three flagellar segments of antennae shorter than the following segments. Clypeus, palpi and proboscis dark brown. *Thorax.*—Scutal integument brown and covered with narrow light brown scales except above the wing roots where there is a short line of narrow yellow scales; dorso-central bristles long, strong and dark and small acrostichial bristles present; scutellum covered with broad flat dark scales. Pleurae pale yellow with a dark brown stripe across the

Fig. 1.—*Uranotaenia lucyae sp.* n. ♂ terminalia.

upper half involving upper part of *ppn*, post-spiracular area, upper sternopleura and prealar knob; upper part of mesepimeron and postnotum also dark brown; *apn* yellow and covered with broad whitish scales; sternopleurae with numerous bristles and with a large patch of broad yellow scales extending from upper bristles to about half way down and along posterior border to near base; mesepimeron with one strong dark bristle below and a few hairs and pale scales above. *Abdomen.*—Tergites dark brown with yellow scales on 2–6 forming narrow basal bands which do not extend to the lateral margins; sternites covered with yellow scales. *Legs* dark brown with no pale spots at the joints; undersides of femora yellowish and the last three tarsal segments slightly paler than the preceding segments. The

dark scales on the femora and tibiae have a blue sheen and the fore and mid femora have a patch of fine hairs below and a tuft of a few long hairs above at middle (this character appears to be absent on the hind legs).

Male.—Differs from the female by having broader basal bands on the tergites and a pale basal band on the seventh tergite.

Terminalia (fig. 1).—Ninth tergite bare, straight across the top in the middle and with the lateral corners excavated. Basal lobe of coxite small and with one long stout apical bristle and five shorter ones below ; *lp* dark and with two small teeth ; style short, stout and swollen on the inner border near the tip which is narrow, curved and with a short apical spine.

Described from type male and one female paratype taken in bush at Kwale, Kenya Coast, East Africa.

In appreciation of her help and encouragement I have named this mosquito after my mother, Lucy Ellinor Tunstall.

Aedes (Aedimorphus) teesdalei sp. n.

This mosquito belongs to the *apicoannulatus* group of the subgenus *Aedimorphus* (Edwards, 1941) and closely resembles *A. haworthi* Edwards. It is easily distinguished from all known mosquitoes of this group by having the white lateral bands on the front half of the scutum continued back to the scutellum. The larvae and pupae are like those of *haworthi* and no constant differences were found.

Female.—Head with a large patch of broad dark scales on either side and with the upright forked scales dark ; scales on the vertex snowy white, those on nape and mid line narrow and round the eye margins a deep band of broad scales which is continued forward between the eyes (sometimes the area of narrow scales is reduced and the broad scales form triangular lateral patches with their apices meeting in front and continuing forward between the eyes). Tori, clypeus, palpi and proboscis dark brown (almost black) with the proboscis sometimes indistinctly paler below ; tori with a large patch of broad white scales on inner border and first flagellar segment of antennae with a few dark scales above. *Thorax.*—Integument of scutum and upper half of pleurae dark brown ; lower half of pleurae paler. Scutum with a background of narrow dark brown scales and ornamented with white scales as follows : A wide marginal band of broad white scales extending from front margin back to scutellum (usually the inner edge of this band is sharp and well defined but occasionally scattered patches of mixed broad and narrow scales blur the outline) ; on either side posteriorly a ragged line of mixed broad and narrow white scales extending from the scutellum to slightly beyond the bare space and with the area between these lines and the white borders sometimes covered with narrow white scales ; bare space sometimes with a few white scales along the top and a narrow white line composed of broad and narrow scales on either side. All lobes of scutellum covered with broad flat white scales. Pleurae with patches of broad white scales ; two on sternopleurae, propleurae and sub-spiracular area each with a small patch, a few on *apn*, a patch on upper mesepimeron and paratergites entirely covered with white scales ; lower mesepimeral bristle absent. *Abdomen.*—Tergites dark with large basal lateral white patches on 1–7 ; sternites white with broad dark apical bands. *Legs.*—Front coxae with dark scales and mid and hind coxae with whitish scales. Fore and mid femora dark, fore femora with a ventral buff line which widens at the base on posterior surface and mid femora nearly all buff behind ; hind femora buff with a small white spot at apex above and a full length dark dorsal line which widens beyond the middle leaving only a narrow ventral pale area on the apical third. Fore and mid tibiae dark with small white apical patches above and a buff ventral line ; hind

tibiae dark with broad white apical bands. Tarsi dark ; first segments of fore and mid legs sometimes pale below and with or without a small apical patch of white scales above ; hind tarsal segments 1–4 with broad apical white bands which vary slightly in width (the fourth segment may have the apical third to a little over a half white) and the fifth segment is white. *Wing* scales all dark ; no spot of white scales at base of costa.

Male.—Palps about as long as proboscis, dark, with the apical two segments short and hairy and with a pale band at the base of the terminal segment. Otherwise like the female but the white scales on posterior third of scutum tend to be more numerous and abdominal

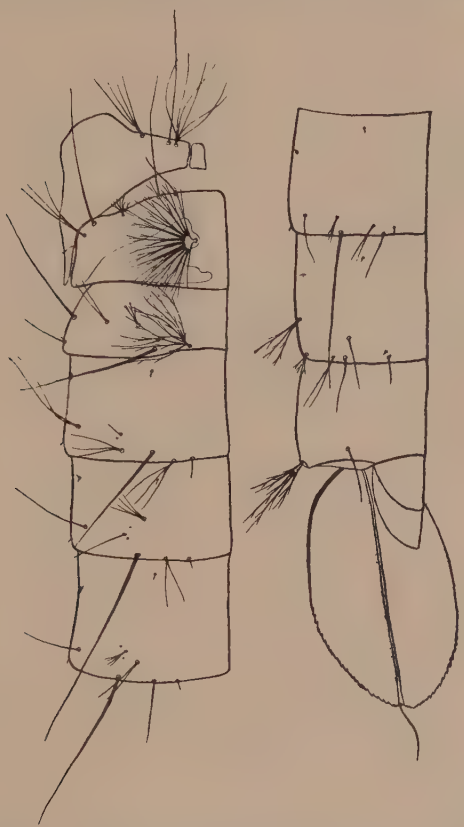

FIG. 2.—*Aedes* (*Aedimorphus*) *teesdalei* sp. n. Pupa.

tergites 3–5 or 6 have narrow basal bands of white scales and the eighth tergite is all white. *Terminalia.*—As those of *A. marshalli* Theo. Basal lobe of coxite with five short spines above ; style not much widened in the middle, with a short stout spine on the inside just beyond the middle and associated with it a number of short hairs and spines ; narrow portion of style beyond spine short.

Pupa.—The setae are all very fine with the long single setae stronger than the rest. The length of the setae and the number of branches vary considerably on individual pupae.

The nomenclature used in describing pupae is that of Knight and Chamberlain (1948).

Thorax.—Trumpets dark with the tips slightly paled, short and widening distally; opening large and oblique. Hair 1 long, single and fairly strong; 2 and 3 finer, about half the length of 1 and usually single but may be bifid beyond the base; 5 and 7 nearly as long as 1, single or bifid; 4 with 2–4 branches and about half the length of 7; 6 a single very short hair about a fourth the length of 4; 8 and 9 almost as long as the trumpets, 8 with 2–3 branches and 9 usually bifid but may be single or 3-branched beyond the base; 10 long and with 3–8 branches, 11 longer and single and 12 a little shorter and with 3–5 branches. *Abdomen* (fig. 2).—Hair 1 and 13 present on segments II–VII and III–VIII respectively. Seta 0 present on III–V, its position is not constant on segments IV and V where it is above or below hair 6. Hair 8 short and with 2–3 dendroid branches on segment VII and about a third the length of the paddles, strong, plumose and with 2–3 branches which may be divided again apically on segment VIII. Hair 9 short and with 2–3 branches which may be divided again apically; 10 like 9 but usually single and longer on terminal segments; 11 with 2–3 branches on III–IV and usually single on the other segments; 12 a short single seta internal to 11 on III–V and external on VI–VII. *Segment I.*—Hair 2 a large dendritic tuft of 11–15 branches; 3, 4, 7 and 8 single with 4 and 7 a little over twice the length of 3 and 8 very short and fine; 10 with 2–3 branches and about half the length of 7; 5–6 short, one hair bifid and the other a tuft of 6–9 branches. *Segment II.*—Hair 2 a fine tuft of 10–14 branches which are about the same length as the segment and finely plumose; 3 about half the length of 2, single and external; 4 and 7 single and about the length of the following segment; 5 and 10 about half the length of 7, 5 bifid or single and 10 single; 6 short and with 4–7 branches. *Segments III–VIII.*—Hair 3 a single, short, fine seta placed internal to 2 except on VII where it is either above or slightly external or internal to 2 which has 3–6 branches on III, is bifid on IV and single on the remaining segments; 4 a long single seta on III, shorter on the other segments and single or with 2–5 branches (4 on the fourth segment usually with the more numerous branches); 5 very long, single and rather stronger than the other setae on IV–VI and a short, fine, single seta on III, VII and VIII but sometimes with 2–3 branches on III; 6 short and single or with 2–5 branches (V–VI usually with the more numerous branches); 7 usually single (sometimes bifid) on III–VI and gradually decreasing in length and on VII it has 3–4 branches which are finely plumose and often divided again apically. *Paddles* oval with fairly strong spicules round the apex and with a strong buttress on a little more than the basal half of the external edge; hair 8 long and single or sometimes split into two beyond the base.

Larva. Head.—Antennae about half the length of the head, dark throughout, slightly curved and sparsely spiculate; tuft at a half and with 3–4 finely plumose branches. Seta A with 6–12, B with 2–9 and C with 4–10 plumose branches; *d* small and fine with 5–8 branches (usually 2–3 main branches which divide again apically); *e* and *f* short and fine and with 2–3 and 3–5 branches respectively. Mentum pentagonal and with 12 teeth on either side, the basal 3 teeth small and widely spaced. *Abdomen.*—Comb a patch of 23–30 small scales which are either broad or narrow and with long or short fringes (all scales can be of one form or they may be mixed on a single specimen). Siphon dark with an index of $2\frac{1}{2}$–3 in mounted specimens; subventral tuft with 2–7 branches, placed at a half and about the length of the diameter of the siphon at point of attachment; pecten of 17–25 close set dark spines each with one coarse ventral denticle and 1–3 smaller ones. Saddle large, with the lateral seta slightly shorter than the length of the saddle and single or with 2–3 simple branches; lower caudal seta long and single and upper with 4 branches; ventral brush with four 5-branched setae in the barred area and 2 unpaired tufts outside. " Gills " broad, pointed, with the upper pair 2–$2\frac{1}{2}$ times the length of the saddle and the lower pair shorter.

Described from type male, 33 female and 23 male paratypes and 11 associated larval and pupal pelts. Bred from larvae collected from " bamboo pots " in forest at Kwale, Kenya Coast by Mr. C. Teesdale of the Division of Insect-borne Diseases, Nairobi.

Culex (Culiciomyia) furlongi sp. n.

There are four Ethiopian mosquitoes with which this species might be confused, *C. nebulosus* Theobald, *C. nebulosus* var. *pseudocinereus* Theobald, *C. cinereus* Theobald, and *C. cinereus* var. *uniformis* Theobald, but the sparsely scaled mesepimeron will separate it from *C. cinereus* and *nebulosus* var. *pseudocinereus*. From the other two it can be distinguished on male characteristics only. The male differs from all four species mentioned by the character of the outstanding scales on the shaft of the palps (the distal scales having very fine, short, straight points) and the terminalia are characteristic as the phallosomes have no long basal tooth.

Female.—Head with a distinct band (sometimes widening slightly on either side) of broad, flat, white scales round the eye margins ; rest of scales on head including upright scales pale buff. Proboscis, palpi, tori and clypeus dark brown ; palpi about one sixth the length of the proboscis. *Thorax.*—Integument with a grey bloom and dark brown except the mesepimeron which is green or pale yellow. Scutum with acrostichial bristles and covered with narrow dark brown scales. Pleurae with broad, dark cream scales on *apn* and *ppn* with narrow creamy scales on upper edge and some broad flat scales below ; sternopleurae with a broad band of creamy scales on posterior border and mesepimeron with a few creamy scales among the upper hairs and one lower bristle ; propleurae and pronotum bare. *Abdomen* dark blackish brown above and each tergite with broad white borders which widen distally ; sternites all whitish or with a few dark scales on mid line. *Legs.*—Coxae with

Fig. 3.—*Culex* (*Culiciomyia*) *furlongi* sp. n. (*a*) distal outstanding scales on shaft of ♂ palpi. (*b*, *c*) ♂ terminalia ; (*b*) phallosomes ; (*c*) coxite.

patches of white scales in front and greenish integument. Fore and mid femora dark with a ventral white line broadening at the base beneath ; hind femora white with a dark dorsal line which is broad on the apical half and extends back narrowly to near the base. All tibiae and tarsi dark ; tibiae and first tarsal segments with a pale line below.

Male.—Palpi very little longer than the proboscis, with the last two segments hairy and the terminal a little over twice as long as penultimate ; the shaft has 11–13 outstanding

scales, the proximal being spearhead-shaped with long fine points and the distal are small with very short, fine, straight points (fig. 3*a*). Otherwise as described for the female but usually the tergites are all dark (sometimes 6 and 7 with narrow borders of pale scales) and sternites sometimes with more numerous dark scales on mid line. *Terminalia* (fig. 3*c*).—Style bent in the middle with a membranous flange on the bend, a spiny crest before the tip and with five short hairs on the bend and one below the spiny crest. Coxites with a ventro-lateral patch of about 20 long, stout hairs, a small ventral patch of short, stout hairs on the outside of the lobe and a small tergal patch of short fine hairs at the base of the leaf. Lobe

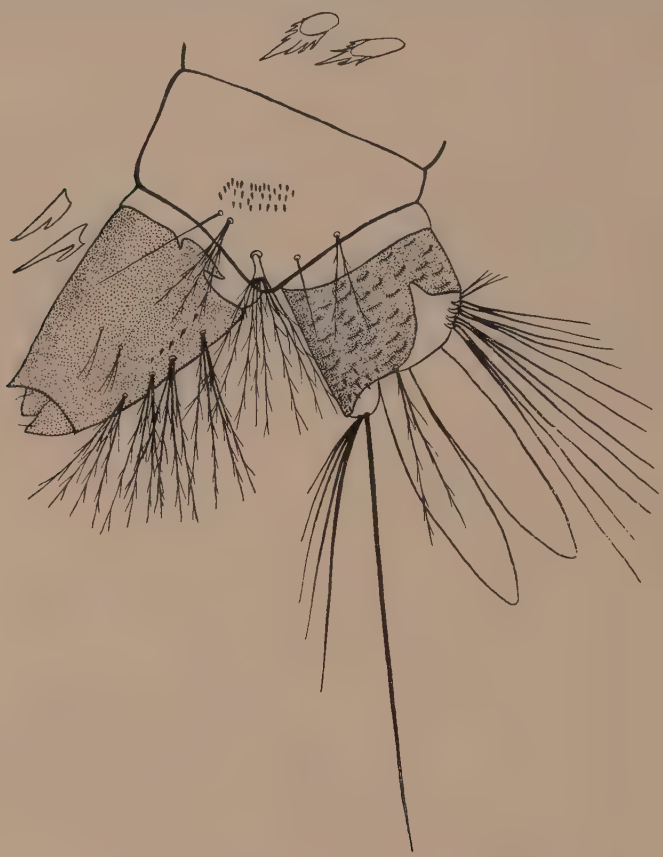

FIG. 4.—*Culex* (*Culicomyia*) *furlongi* sp. n. Larva.

with two leaves, one sinuous, with a narrow stem and a broad square tip and the other broad and rounded ; rod *a* pale, stout, blunt and straight, *b* and *c* dark and curved at tip with *c* narrow and separated from the others ; hair *h* a long stout hair at the base of the broader leaf and *d-f* short, narrow leaflets which sometimes appear as stout hairs ; phallosomes (fig. 3*b*) with no prominent basal teeth and ending in long finger-like processes which are simuous and slightly swollen at the tip.

Early stages.—The adult hatched from the pelts described below was examined and named but unfortunately it has since been lost.

Pupa.—The only specimen is badly denuded. It resembles *nebulosus*, having a pair of long setae on the thorax in front, short pale trumpets and broad,

rounded, deeply notched paddles. It differs by having an accessory paddle seta.

Other characters seen are as follows :

Thorax.—Trumpets short, broad, pale, with no obvious tracheoid area at base and with a large opening. All hairs fine except 5 which is stout, finely plumose, very long and with 2 or 3 branches ; 4 and 6–8 bifid with 6 half and 7 twice the length of 4 and 8 short ; 10 short and bifid, 11 a little longer and single and 12 bifid, finely plumose and slightly longer than 11. *Abdomen.—Tergite* I : Hair 3 very short and about one sixth the length of 4 which is single ; 7 single and longer than 4 ; 8 minute and single and 10 bifid and half the length of 7. *Tergites* II–VIII : Hair 2 short and with about 15 sparsely and finely plumose branches on II and single and very short on V–VII ; hair 4 longer and stronger than 2 on II and III ; hair 5 stout and single on VI and fine, short and single on VII ; hair 8 about half the length of the paddles and with 10 plumose branches on VIII. Paddles broad and rounded with a deep notch at tip ; hairs 7 and 8 present, both very short fine and single.

Larva.—Easily separated from the very similar *cinereus* on the character of the comb which is composed of sharp pointed spines instead of scales.

Head.—Antennae pale, short and without spicules ; tuft at a half, short and with about six simple branches. Setae A, B and C short, fine, plumose and with 5–6, 4–5 and 3 branches respectively ; *d* very short and bifid and *e* and *f* fairly long and single or bifid. Mentum short and broad with about 23 very fine teeth on either side of the central tooth. *Abdomen* (fig. 4).—Comb a semicircular patch of 31 small, strong, sharp pointed spines, each with a basal fringe of a few fine denticles. Siphon dark and short (index of mounted pelt just over 1) ; pecten extending to about the middle of the siphon and composed of 3–5 small spines, the basal ones with one coarse ventral tooth and the apical two simple ; four long, plumose subventral tufts present, each tuft 4-branched ; a lateral seta just beyond the middle and the subdorsal seta immediately above it are simple, short and with 3 and 2 branches respectively. Anal segment with a complete saddle which has a few strong spicules on the distal edge above and is covered with short, curved bands of minute spicules ; lateral seta a little longer than the saddle, bifid and finely plumose ; lower caudal seta single and upper with 5 branches ; ventral brush with 4 pairs of 2–3 branched setae in the barred area and 2 very short bifid setae outside. " Gills " pointed and about twice the length of the saddle.

Described from type male, 10 female and 8 male paratypes and one pupal and one larval pelt. Adults were bred from larvae found in " bamboo pots on ground " and " up trees " in forest at Kwale on the Kenya Coast by Mr. M. Furlong, Division of Insect-borne Diseases, Nairobi.

The type specimens of the mosquitoes described above will be deposited in the British Museum (Natural History).

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THREE APPARENTLY NEW MEALY BUGS FROM KENYA.

By G. De Lotto
(*Department of Agriculture, Kenya.*)

The following descriptions of three apparently new species of mealy bugs represent the result of the examination of a small number of species of Pseudococcidae in the collections of the Scott Agricultural Laboratories of the Department of Agriculture, Nairobi, or recently collected in various localities of Kenya.

Planococcus rotundatus sp. n. (fig. 1).

External appearance not recorded.

In mounted specimens body very broadly oval, almost circular ; length 1·9 to 2 ·3 mm., breadth 1·5 to 2 mm.

Antennae of eight segments, lengths of which in microns are : (i) 56–65 ; (ii) 56–65 ; (iii) 52–60 ; (iv) 30–39 ; (v) 47–56 ; (vi) 47–52 ; (vii) 47–52 ; (viii) 95–120. *Legs* normal, third pair being a little longer than the others. Length in microns of hind pair : coxa 125–138 ; trochanter plus femur 297–335 ; tibia 202–228 ; tarsus 95–112. Breadth of femur 73 to 91. Tarsal digitules long and slender, ungual ones shorter and stout, both knobbed at apex. Coxa III with a few translucent pores along outer margin. *Beak* normal, two segmented. *Dorsal ostioles* large, not sclerotised, the lips with a few moderately long and stout setae and a cluster of trilocular pores. Margin of body provided with a complete series of 18 *cerarii*, each with two robust, sharp-pointed spines 24 to 30 microns in length, surrounded by trilocular spores. Some cerarii, but not those of anal lobes, occasionally provided with a small stout seta, similar to those of dorsal surface of body. *Anal lobes* without any sclerotisation on dorsal surface ; cerarian spines more or less of same shape and length as those of body, with 4 to 7 small supplementary setae and 25 to 30 trilocular pores. Ventral surface with a slightly sclerotised bar extending from apical or subapical seta. *Trilocular pores* not very numerous, evenly distributed on body surface. *Tubular ducts* very few, scattered. *Multilocular disc pores* few, confined to ventral side of last segments and normally arranged in three groups as follows : (vii) 2–9 ; (viii) 9–16 ; (ix plus x) 5–10. *Ventral setae* rather long and slender ; dorsal setae short and stout. *Dorsal tubular ducts* absent. *Circulus* normally rounded.

Holotype female and 7 ♀ paratypes. Kenya : Nairobi, 10.vii.1951, collected on branches of *Acacia abyssinica* Hochst (*G. De Lotto*).

The holotype and one paratype have been deposited in the British Museum (Nat. Hist.), London ; two paratypes in the U.S. National Collection of Coccidae, Washington, D.C., U.S.A. ; the remainder in the collection of the Department of Agriculture, Nairobi, Kenya.

This species comes close to *Planococcus kenyae* (Le Pelley) from which it differs in the absence of any sclerotisation on the dorsal surface of the anal lobes and by having fewer multilocular disc pores.

Planococcus subukiaensis sp. n. (fig. 2).

External appearance not seen.

Body oval, mounted specimens measuring 1·8 to 2·4 mm. long ; 1·2 to 1·7 mm. broad.

Antennae normal, 8-jointed : (i) 47–60 ; (ii) 43–60 ; (iii) 43–60 ; (iv) 26–34 ; (v) 32–47 ; (vi) 34–43 ; (vii) 39–43 ; (viii) 82–99 microns. *Legs* normal, dimensions in microns of third

pair being : coxa 108–129 ; trochanter plus femur 242–301 ; tibia 202–228 ; tarsus 95–108. Breadth of femur 66 to 77. Tarsal and ungual digitules as usual for the genus. Coxa and tibia of hind legs provided with some translucent pores. *Beak* normal, two segmented. *Dorsal ostioles* present, anterior pair rather inconspicuous and all having on their lips a cluster of trilocular pores and 2–3 small setae. *Cerarii* in a complete series of 18 pairs, all normally built up with but two spines of the usual shape, which, except the anal ones, are surrounded by 5 to 11 trilocular pores. Derma around cerarii not sclerotised. *Anal lobes* not sclerotised on dorsal surface and the two spines only a little longer than those on remainder of body and are accompanied by a cluster of 20 to 30 trilocular pores and 4 to 5 small supplementary setae. Ventral surface characterised by a strongly sclerotised bar arising from apical seta

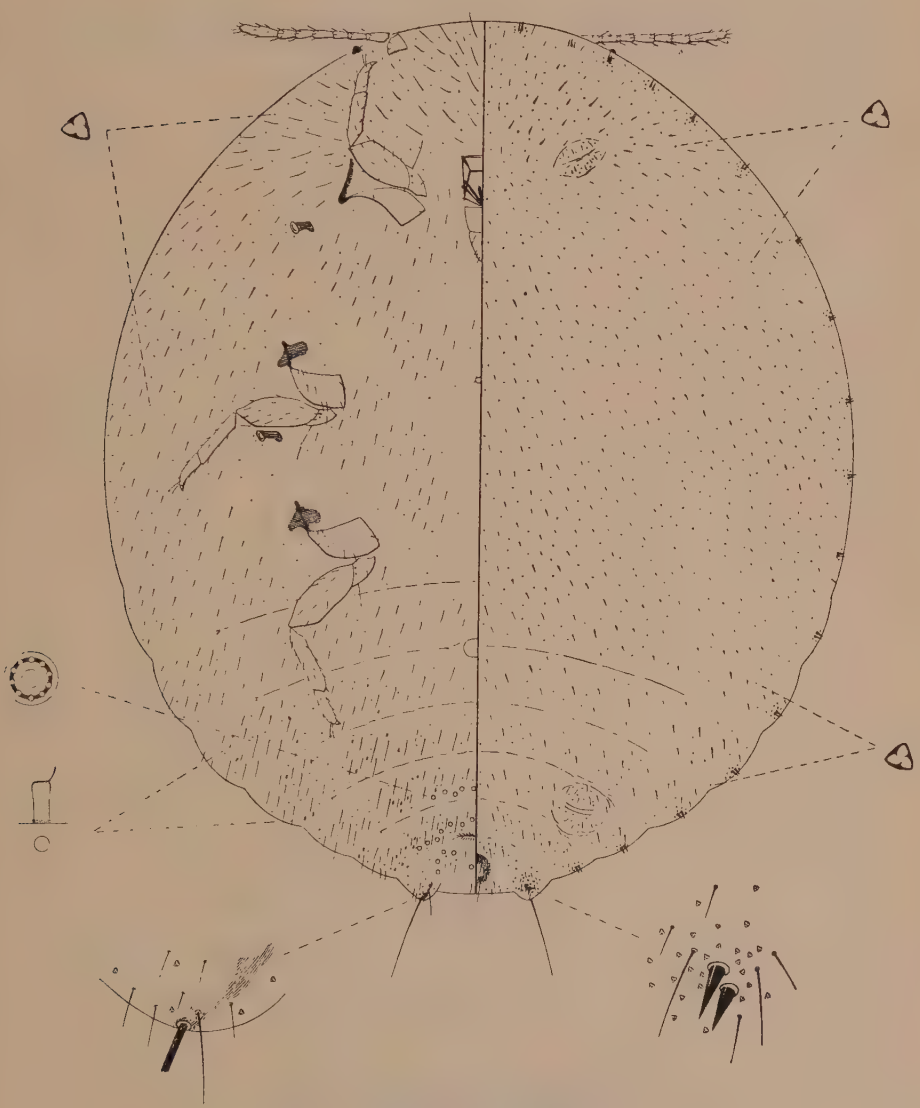


Fig. 1.—*Planococcus rotundatus* sp. n.

and having near the middle a short subapical hair. *Trilocular pores* uniformly distributed on both surfaces of body but not numerous. *Tubular ducts* few and mostly grouped in small clusters on the ventral side of the margin of seventh and eighth segments. *Multilocular disc pores* in five groups, which on segments anterior to genital opening are disposed only along distal margin of segment involved. Their number is as follows : (v) 22–27 ; (vi) 27–32 ; (vii) 29–40 ; (viii) 19–28 ; (ix plus x) 20–22. One or two other multilocular disc pores present below the attachment of first pair of legs. *Ventral setae* few and slender ; dorsal setae much shorter and rather stout. *Dorsal tubular ducts* absent at least on specimens at hand. *Circulus* rounded and not sclerotised.

Holotype female and 5 ♀ paratypes. Kenya : Subukia, 8.viii.1933, collected on an unknown plant (collector unknown).

The holotype has been deposited in the British Museum (Nat. Hist.), London; one paratype in the U.S. National Collection of Coccidae, Washington, D.C.,

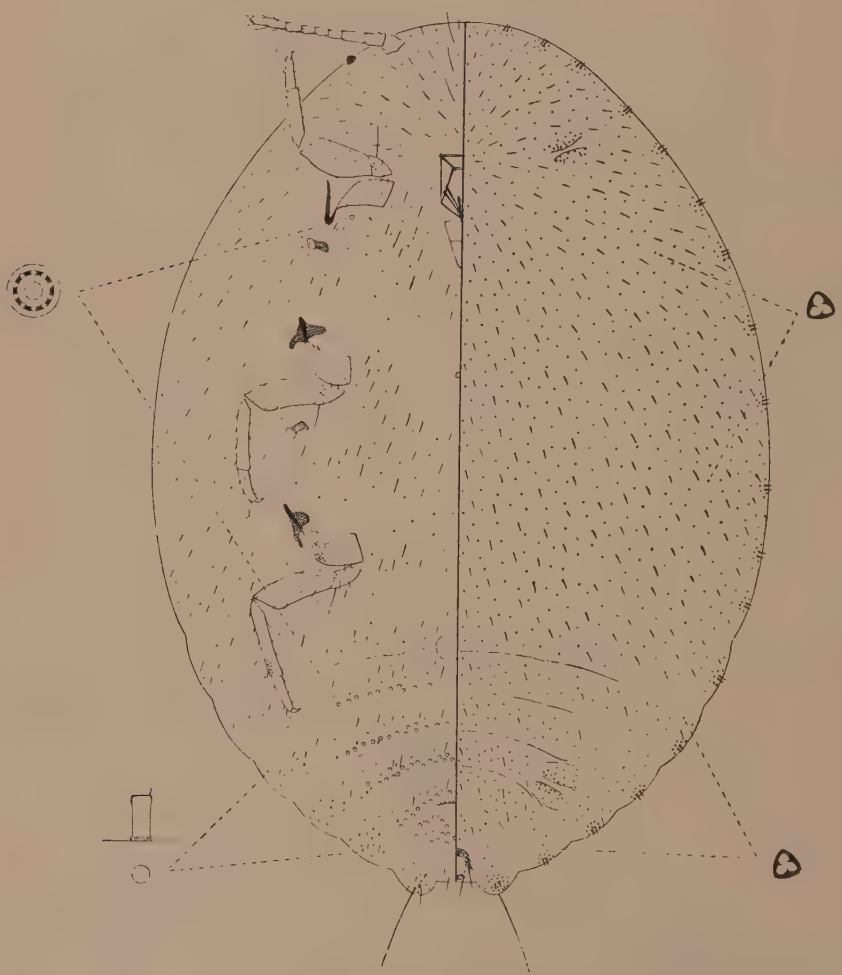


Fig. 2.—*Planococcus subukiaensis* sp. n.

U.S.A.; the remaining four paratypes are in the collection of the Department of Agriculture, Nairobi, Kenya.

This species is very close to *Planococcus citri* (Risso) from which it can be separated by regularly having a smaller number of multilocular disc pores and by their normal disposition in rows only along the distal margin of the segment involved.

Acknowledgments are due to Dr. R. H. Le Pelley, Senior Entomologist, for the permission to describe this species which was already recognised by him as probably undescribed (1952) when studying *Planococcus kenyae* (Le Pelley) and some related species.

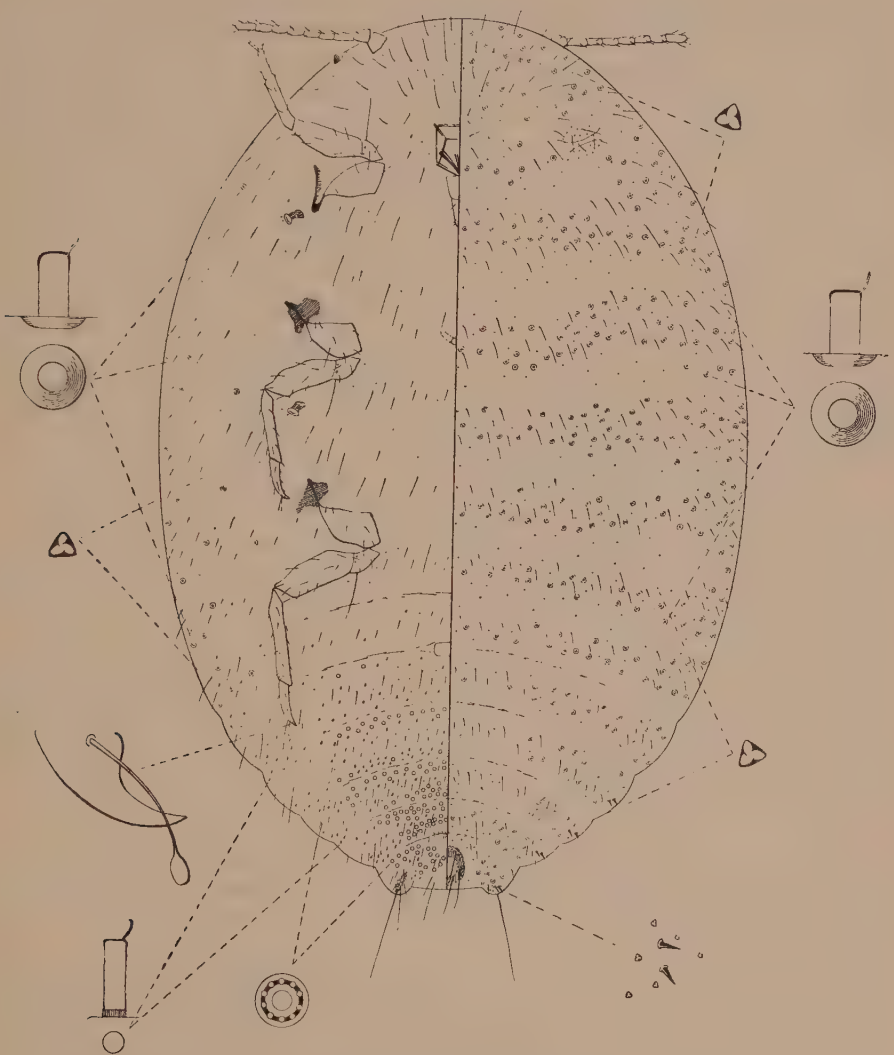


FIG. 3.—*Spilococcus perforatus* sp. n.

Spilococcus perforatus sp. n. (fig. 3).

External appearance not recorded.

Body oval, mounted specimens measuring in length 2·1 to 2·8 mm.; breadth 1·3 to 1·7 mm.

Antennae of nine segments: (i) 52–60; (ii) 47–52; (iii) 49–73; (iv) 30–39; (v) 39–47; (vi) 37–45; (vii) 34–43; (viii) 34–43; (ix) 52–60 microns. *Legs* normal; length in microns of third pair: coxa 129–155; trochanter plus femur 271–314; tibia 194–258; tarsus 103–112. Breadth of femur 65 to 77. Claw without denticles; tarsal and ungual digitules of usual shape and form; distal end of tibia with a few small translucent pores. *Beak* two-segmented. Both pairs of *dorsal ostioles* present but rather inconspicuous, each lip having a cluster of few trilocular pores and 2–3 small setae. *Cerarii* confined to the four or five—occasionally six—ultimate segments, each normally built up with two conical spines. In the preanal cerarii, which are neither beset by any concentration of trilocular pores nor by a pigmented area, spines tend to be rather widely separated and in some instances only one is present. *Anal lobes* well developed, with an indefinite slightly sclerotised area on dorsal surface. The two cerarian spines of same length and form as preceding ones and surrounded by few trilocular pores and a supplementary seta. Ventral surface provided with an ill-marked, irregular, elongate bar extending from apical seta and having a subapical seta more or less on its centre and with 4 to 6 other seta. *Trilocular pores* not numerous and widely distributed on body. *Tubular ducts* of oral rim type small but abundant on ventral surface of ultimate abdominal segments, especially along the distal margin of sixth segment. *Multilocular disc pores* confined to ventral side of last abdominal segments and arranged in five, occasionally in six, groups: (iv) 0–2; (v) 1–7; (vi) 23–34; (vii) 45–64; (viii) 66–76; (ix plus x) 33–45. Characteristic of this species is the disposition of the pores on the sixth segment, where they are crowded mostly in a row along the basal margin. *Dorsal tubular ducts* with oral rim slightly sclerotised are very numerous on whole surface of the dorsum, where, with the exception of the head, they are disposed in rather regular transverse rows. *Circulus* rather elongate transversally and not sclerotised.

Holotype female and 12 ♀ paratypes. Kenya: Mombasa, 25.vi.1952, collected on branches of *Ziziphus mucronata* Willd. (*G. De Lotto*).

The holotype and two paratypes have been deposited in the British Museum (Nat. Hist.), London; three paratypes in the U.S. National Collection of Coccidae, Washington, D.C., U.S.A.; the remainder are in the collection of the Department of Agriculture, Nairobi, Kenya.

This species appears fairly close to *S. eriogoni* (Ehrhorn), from which it is separable by the presence of the circulus and a sclerotised bar on the ventral side of the anal lobes, and by a larger number of oral rim ducts on the dorsal surface of the body, whilst on the ventral surface they are lacking, except, at times, a few along the marginal area.

Reference.

Le Pelley, R. H., 1952, Variation in a character in some species of *Pseudococcus* (Hemiptera: Coccidae). *Proc. R. ent. Soc. Lond.* (B) **21**: 83–85.

A NEW SAWFLY GENUS OF THE MONOCTENINAE (HYM., DIPRIONIDAE) IN MOROCCO.

By Robert B. Benson, M.A., F.R.E.S.

British Museum (Natural History).

Through the kindness of Professor J. Pasteels of Brussels I have recently received from Monsieur Gouin, Conservateur au Musée Zoologique de Strasbourg, a most interesting Diprionid sawfly from Morocco for determination. Unfortunately there is only a single specimen of it, a solitary male. But it differs from all previously known Diprionidae in that the branches of the antenna are expanded into leaf-like blades (fig. 1). It belongs to the Monocteninae (see Benson, 1945) as redefined below.

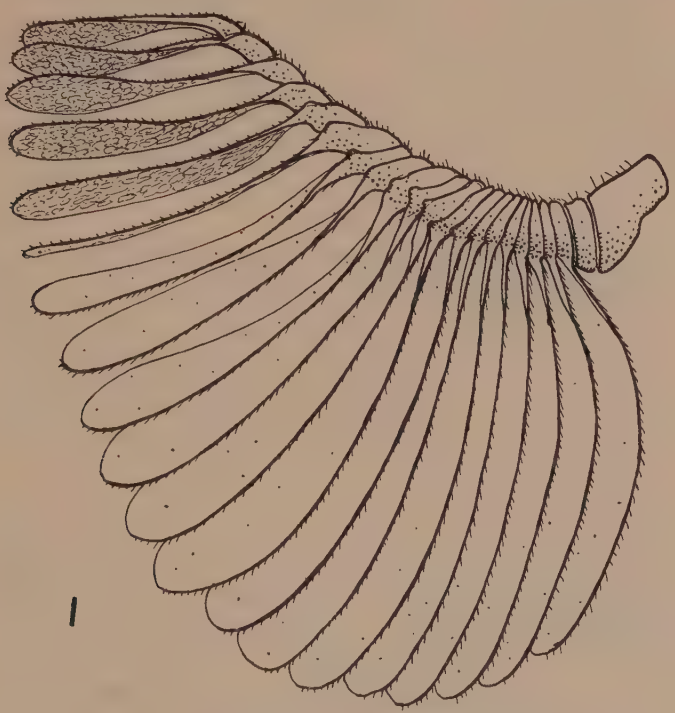


Fig. 1.—Left antenna of ♂ *Rhipidoctenus* gen. n.

I am further indebted to Dr. Remington Kellogg, Director of the U.S. National Museum, Washington, and to Dr. B. D. Burks, of the same institution, for kindly allowing me to borrow a male of *Augomonectenus libocedrii* Rohwer for comparison with the new species.

As the known host-plant association of Monocteninae is with the Cupressaceae (*Augomonectenus* on *Libocedrus decurrens* Torr. and several *Monoctenus* spp. on *Juniperus*) and Taxodiaceae (*Monoctenus decoratus* Takeuchi on *Cryptomeria japonica* D. Don. in Japan (Takeuchi, 1949, p. 50)) it seems likely that the new genus from Morocco is likewise associated with Cupressaceae of which the genera *Cupressus*, *Juniperus* and *Tetraclinis* are represented in Morocco by native species.

Key to Subfamilies of Diprionidae.

A. Anal cell of fore wing divided into two by a medial constriction and without a cross-vein ; cu–a oblique ; Sc + R not angled at junction with Rs and 2nd sector of M, so that cell C is not noticeably swollen at this point (figs. 2 and 3) ; cell C with or without cross-vein Scl ; 2nd sector of M sigmoid in shape. Wings often densely pubescent with ciliate margins. Antenna of ♂ uniramous. Attached to Cupressaceae and Taxodiaceae. [For key to genera see below] . . . . . Monocteninae.

B. Anal cell of fore wing contracted towards the base but not constricted, and with a cross-vein behind the middle ; vein cu–a suberect ; Sc + R is angled at junction with Rs and 2nd sector of M, so that cell C is swollen at this point (fig. 4) ; cell C always with cross vein Scl ; 2nd sector of M straight. Wings but sparsely pubescent and with naked margins. Antenna of ♂ with at least the 10 basal segments biramous. Attached to Pinaceae. [For key to genera see Benson, 1939 and 1945] . . . . . Diprioninae.

Key to Genera of Monocteninae.

1. Mesoscutellum acute in front. Fore wing with 2nd free sector of M fusing with Sc + R before the origin of RS (fig. 2). Head behind the eye only about half as long as the eye in dorsal view. Clypeus subtruncate in front. Colour not metallic . 2.

–. Mesoscutellum obtuse in front. Fore wing with 2nd free sector of M fusing with RS after RS has left Sc + R (fig 3). Head behind eye almost as long as eye. Clypeus emarginate in front. Colour metallic.

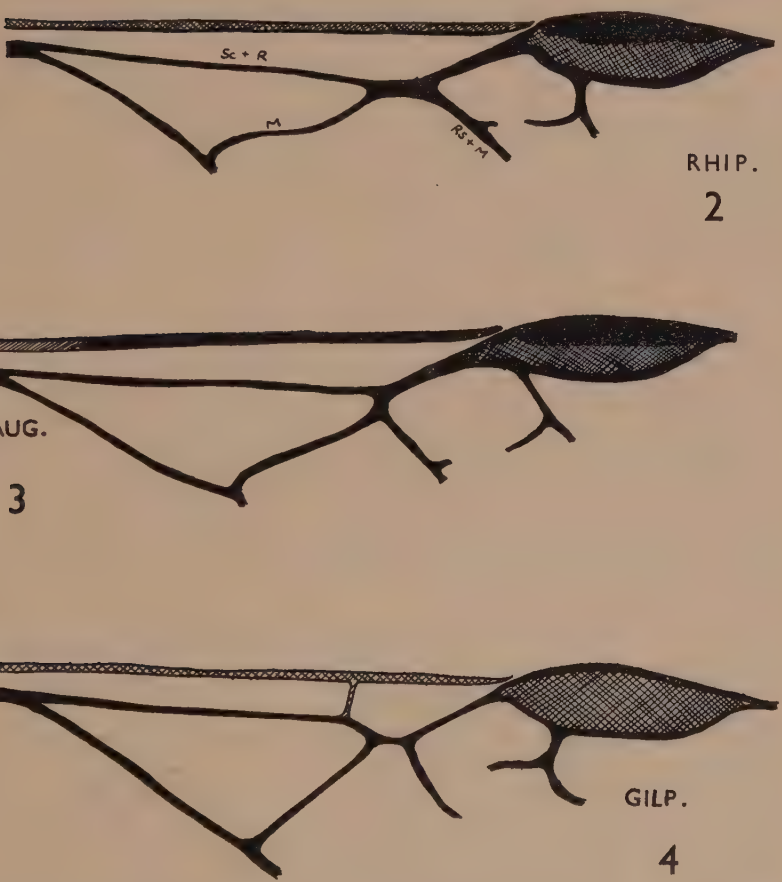
Hind ocelli about as far apart as each is from the eye margin and about one and a half times this distance from the back of the head. Cenchri far apart so that the distance between them is more than half their width. Fore wing with cell C not crossed by vein Scl ; hind wing with a long stalk to the anal cell about twice as long as the greatest breadth of the anal cell. Rami of male antenna scarcely flattened, circular or oval in cross-section. Larvae on *Libocedrus*. Western N. America (Oregon). Monotypic. Type : *Augomonoctenus libocedrii* Rohwer

Augomonectenus Rohwer, 1918.

2 (1). Cell C of fore wing crossed by the vein Scl near the origin of Rs + M ; anal cell in hind wing with a stalk twice as long as greatest width of cell. Cenchri far apart so that the distance between them is more than half the width of one. Hind

ocelli about as far apart as each is from an eye margin or from the back of the head. Labial palps normal. Rami of male antenna not flattened, almost circular in cross-section. Larvae on *Juniperus* (Cupressaceae) or *Cryptomeria* (Taxodiaceae). Holarctic. 9 species. Type : *Tenthredo juniperi* L. . . . . **Monoctenus** Dahlbom, 1835.

. . Cell C of fore wing not crossed by a vein ; anal cell of hind wing with stalk about as long as greatest width of cell. Cenchri close together so that the distance between them is scarcely more than the length of one. Hind ocelli about twice as far apart as each is from an eye margin, and about as far apart as each is from the back of the head. Labial palp (at least in male) with the two apical segments swollen and concave above. Rami of male antenna flattened into leaf-like blades (fig. 1). Larva unknown. Morocco. Monotypic. Type : *Rhipidoctenus cinderellae* sp. n. . . . . **Rhipidoctenus** gen. n.



Figs. 2–4.—Portion of right fore wing in : (2) *Rhipidoctenus* gen. n. ; (3) *Augomonectenus ;* and (4) *Gilpinia.*

Rhipidoctenus gen. n.

Male (female unknown): Robust and smooth insect; head about as broad as thorax to include tegulae. *Head* with clypeus truncate in front; malar space about as long as the diameter of the front ocellus and less than the length of the 2nd antennal segment; temples behind eyes about half as long in dorsal view as the length of an eye; hind ocelli about twice as far apart as each is from an eye margin (POL : OOL as 1·0 : 0·5) and about as far apart as from the hind margin of the head (POL : OO–CL as about 1 : 1). Maxillary palp 6-segmented; labial palp 4-segmented; the 2 apical segments about twice as broad as maxillary palp; the apical segment shaped like a slipper and about twice as long as the 3rd which is cup-shaped, both these segments being deeply concave above with a sensory pit. *Antenna* 22-segmented; with each of the 20 flagellar segments bearing beneath a flat leaf-like blade (fig. 1); the blades on the lower segments are about as long as the main axis of the whole antenna, each blade expanding from the base to just before the rounded apex where they are about one-fifth as broad as their total length. *Mesonotum* with front lobes not divided medially and scutellum acutely pointed in front; post-tergite clearly defined by a continuous furrow but less than half as long as a cenchrus; cenchri close together in the middle where they are not separated by a distance more than the length of a cenchrus. *Legs* with front inner spur longer than apex of tibia and about twice as long as the outer spur; hind legs with tarsus about as long as tibia; and with tibial spurs simple and of equal length, acute at tips, and only about as long as the breadth of the basitarsus; basitarsus about three times as long as broad and about as long as 2nd and 3rd tarsal segments together; pulvillar pads normal; claws with very small subapical tooth. *Wings* with cell C in the fore wing not crossed by the vein Sc1; the 2nd free sector of M is sigmoid in shape and joins Sc + R before RS issues from it; vein 1rm is very close to stigma so that cell 1R1 is broader than its greatest length along RS + M; anal cell of hind wing with stalk about as long as greatest width of cell. *Abdomen* with 1st tergite divided medially and exposing a triangle of membrane. Type species: *R. cinderellae* sp. n.

Rhipidoctenus cinderellae sp. n.

Male: Black with the tegulae, tibiae and tarsal segments of all legs (except the apices of these segments in the hind legs) ± brownish. Wings hyaline; costa brownish white; stigma and rest of venation piceous to brown.

Whole surface smooth and shining with at most sub-obsolete surface sculpture and scattered pale pubescence on head, mesonotum, mesopleurae (but not mesosternum) and legs, but apart from basal tergites very sparingly on abdomen. Length 6 mm.

Holotype male, Morocco: Oudjda, 1922 (*Dr. Sicart*) (Mus. Zool. Strasbourg).

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ETHIOPIAN CULICIDAE: DESCRIPTIONS OF A NEW *CULEX*, THE FEMALE OF *ERETMAPODITES TONSUS* EDWARDS AND THE EARLY STAGES OF TWO *AEDES* OF THE SUBGENUS *BANKSINELLA* THEOBALD.

By Mrs. E. C. C. van Someren.
(*Division of Insect-borne Diseases, Medical Research Laboratory, Nairobi, Kenya.*)

Aedes (*Banksinella*) *albicosta* Edwards.

Larva.—A sprinkling of small rounded sclerotised plaques on the clypeal integument of this larva will separate it from any of the three known Ethiopian *Banksinella* larvae. In all other respects it is very like the larva of *A.* (*B.*) *circumluteolus* Theobald as described by Hopkins (1952).

Head: clypeal integument covered with sclerotised plaques of two sizes (clearly seen under high powers of the microscope) and there is a small patch of similar plaques on the integument of the head at the base of the antennae. Antennae dark, less than half the length of the head, sparsely but coarsely spiculate and with a tuft of 7–8 simple branches placed just below a half. Setae A, B and C with 9–11, 4–6 and 6–9 branches respectively; *e* and *f* usually bifid but *f* sometimes trifid. Mentum with 16–17 teeth on either side of the central tooth. *Abdomen:* comb a small patch of 8 or 9 spines which have a basal fringe of short fine denticles (fig. 1*a*). Siphon pale and with an index of about 3 in mounted skins; the subventral tuft has 3–5 short, simple branches and is placed just beyond the pecten which reaches to over a half; the pecten consists of 14–16 spines, the proximal spines each having one coarse and sometimes another smaller ventral denticle and the last 1 or 2 spines are simple and wider spaced. Saddle large but interrupted on the ventral line and with the lateral seta about half its length and single or with 2–3 branches; upper caudal seta with 11–14 branches and lower single. Ventral brush with 5 paired setae in the barred area and 4 unpaired setae outside. "Gills" pointed, about $1\frac{1}{2}$ times the length of the saddle and equal.

Pupa.—Thorax: integument of dorsum darkened. Trumpets pale but with the base and apex darkened, short and cylindrical and only slightly widened at tip. Hairs 1–9 short and fine, with 6 about one-third the length of 7 and 2, and 5 slightly shorter than the others; hairs 3 and 9 usually single with 1, 4 and 6 bifid and 2, 5, 7 and 8 with 2–3 branches: hairs 10–12 short, fine and about equal in length and with 10 and 11 placed close together; hair 10 with 6 sparsely plumose branches and 11 and 12 simple and single and 2–5-branched respectively. *Abdomen* (fig. 1*c*). Hairless setal ring O is present on segments III–V. Hair 3 may be external or internal to 2 on segments VII. Hair 8 is very short and fine on segments I–VI, short and with 8 branches on the seventh segment and about one-sixth the length of the paddles and with 6 simple branches on the eighth segment. Hairs 9–12 are as usual for *Aedes*. *Tergite I:* hair 2 a dendroid tuft of about 16–18 plumose branches; 3 and 4 widely separate, with 3 very short and single or bifid and 4 with 7–9 branches and only slightly longer than 3; 7 and 10 about the same length and single and bifid respectively. *Tergite II:* hair 2 short and with 9–11 sparsely and finely plumose branches; 3 short and single and placed external to 4 which is single and about the same length as 2; 5 short and 6 much longer and with 4–6 and 3–4 branches respectively; 7 bifid and 10 trifid. *Tergites III–VII:* hair 2 with 2–5 branches, short on

III and VII and long on IV–VI; 4 about the same length as 2 on III and single, much shorter on V–VII and 2–3-branched on V–VI and with 4–7 branches on IV and VII; 5 short and with 5–7 branches on III and as long as 2 on IV–VII and with 3–5 branches; 6 short with 4–8 branches except on VII where it is slightly longer than 5 and bifid; 7 with 4 branches on VII and single but sometimes bifid on the other segments. *Paddles* oval and pale but with the tip slightly darkened; the mid rib is strong except at the tip where it is very faint and there is a strong buttress on the basal half of the outside edge and fine spicules round the apex. Hair 8 very short and single.

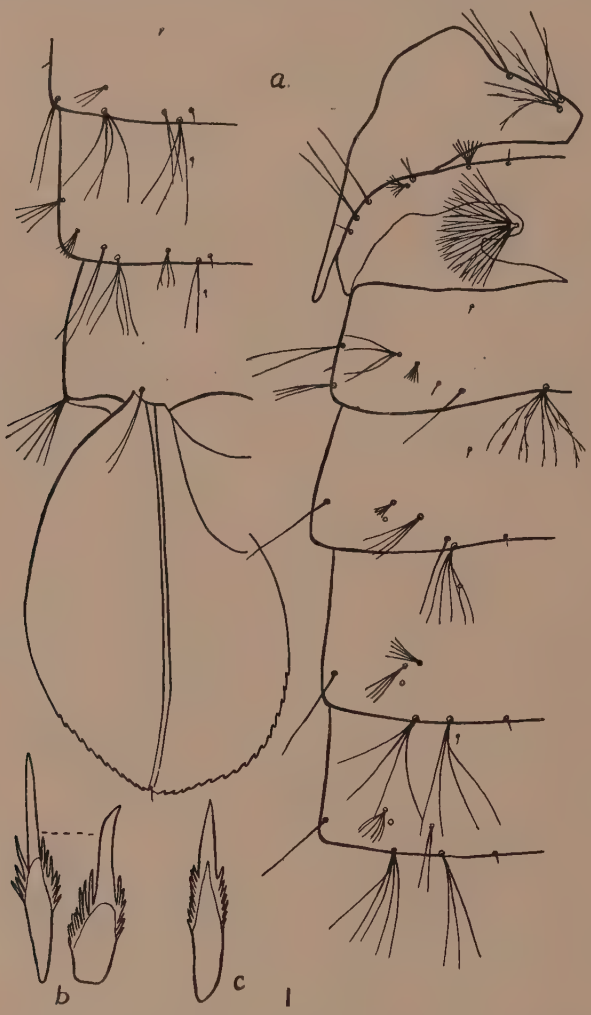

Fig. 1.—*A.* (*B.*) *albicosta*. *a*, pupa; *c*, larval comb spine. *A.* (*B.*) *albothorax*. *b*, larval comb spine.

Described from the paedotypes and 6 other larval and 2 pupal pelts with associated adults. The larvae were taken from a swamp and a rice field at Vanga on the Kenya Coast.

Aedes (*Banksinella*) *albothorax* Theobald.

The adult bred from the early stages described below is badly damaged and, although it is almost certain that the identification is correct, the possibility of error must be borne in mind owing to the poor quality of the material examined. In spite of this it is thought worth while to give a brief description of this material as the larva differs slightly from that described above for *A. albicosta* Edwards.

Larva.—The larva is perhaps inseparable from that of *albicosta* but differences noted are as follows: The comb spines have a coarse basal fringe of denticles with one or two denticles on either side longer than the rest and the pecten spines have only one coarse ventral denticle.

Head with a network of small plaques on the clypeus as in *albicosta* but apparently no patch of plaques at the base of the antennae. Setae missing. Mentum with 17 teeth on either side of the central tooth. *Abdomen:* Comb a patch of 7–8 spines each with a coarse basal fringe of denticles (fig. 1*b*). Siphon with a pecten of 14–15 spines, reaching to over a half, with the last spine wider spaced and each spine with one coarse and sometimes one fine ventral denticle; subventral tuft with 6 short simple branches. Saddle large but interrupted on the ventral line; lateral seta missing; upper caudal seta with about 10 short branches and lower single. Brush with 5 pairs of many-branched setae in the barred area and 3 unpaired setae outside. "Gills" appear to be twice the length of the saddle and pointed.

Pupa.—Very like that of *albicosta*. Differences noted are that the branched setae have fewer branches (usually 3), hair 7 on tergite VII is single on one side and bifid on the other and hair 8 is single on the seventh segment and bifid on the eighth.

Larva collected from a swamp at Mambrui on the Kenya Coast.

Eretmapodites tonsus Edwards.

In 1941 when Edwards described this species only the male was known. A description of the female is given below and additional characters noted for the male are also recorded. The females described here were taken with males which agree with the description given by Edwards for this species.

Female: Head with the usual ornamentation. Tori, clypeus, proboscis and palpi dark; tori and first flagellar segment of antennae with a few small pale scales on the inner border. *Thorax:* Integument of fresh specimens dark brown with bright yellow patches (which tend to darken in dried specimens) on scutal angle, posterior edge of *ppn*, pre-alar knob and lower posterior corner of mesepimeron. Scales of scutum all narrow with yellow scales forming a definite pattern of narrow yellow lines on an almost black background as follows: An almost continuous yellow line round the scutum and two anterior admedian and two posterior lateral yellow lines; the lateral lines curve out at the scutal angle and the median lines extend back to a half at least (posterior part of scutum rubbed). Pleurae with the *apn* covered with broad silvery scales and with a few narrow golden scales on the front margin; *ppn* and postspiracular areas with narrow golden and black scales; there is a fairly large patch of silvery scales above the mid coxae and a continuous stripe of broad silvery scales across the upper part of the pleurae; the postnotum is bare. *Abdomen:* First tergite with 2 dorsal silvery spots and with lateral silvery stripes; second tergite with the oblique silvery line about two-thirds the length of the tergite; sixth and seventh tergites with large silvery spots on apical corners; all other segments with a slanting silvery stripe in the middle of the lateral border. *Legs* dark. Fore and mid coxae covered with golden scales and hind coxae with silvery scales above and golden scales below. All femora golden below and with small white spots at tips, those on the hind legs the largest; hind

femora also with about the basal one-fourth yellow below anteriorly. Wings with a line of golden scales on stem vein below.

Male : As described for the female but tori without scales, first flagellar segment of antennae with a few broad black and yellow scales above and the median yellow lines on the scutum extend back to the top of the bare space.

Described from 2 females and 9 males collected in bush, Nanyuki, Kenya.

Culex (Culex) tenagius sp. n.

The mosquito described below has male terminalia of *C. lacticinctus* Edwards type and is in other respects very similar to this mosquito. It differs by having the proboscis pale below, all dark hind tibiae and longer and hairier male palps. In colouring and external structure it is very like *C. fatigans* Wiedemann and from this the only reliable difference is in the structure of the male terminalia. Although some specimens can be separated from *fatigans* by having 2 or more lower mesepimeral bristles, a number of specimens examined had only one such bristle. The all dark hind tibiae is also an unreliable character as *fatigans* in East Africa often has only a very small indistinct pale spot here and it sometimes appears to be absent.

Fig. 2.—*C. tenagius* sp. n., male terminalia.

Female : head with a patch of broad, flat, creamy white scales on either side ; vertex with the decumbent scales all narrow and creamy white and with the upright scales dark. Proboscis dark with a broad pale creamy white line below from base to near tip (Nakuru) or extending to tip and usually up the sides (Bwamba) ; palpi dark and about one-sixth the length of the proboscis ; antennae without scales. *Thorax :* scutum covered with narrow buff (Bwamba) or light reddish brown (Nakuru) coloured scales and with broad lines of yellow scales on either side of the bare space in front of the scutellum ; scutellum with narrow yellow scales. Pleurae with no post-spiracular or pre-alar scales ; *ppn* with some narrow light brown scales on the upper margin and there are two small patches of

yellow scales on the sternopleurae and a patch of scales in the middle of the mesepimeron which also has two, sometimes three, and occasionally only one lower mesepimeral bristle.

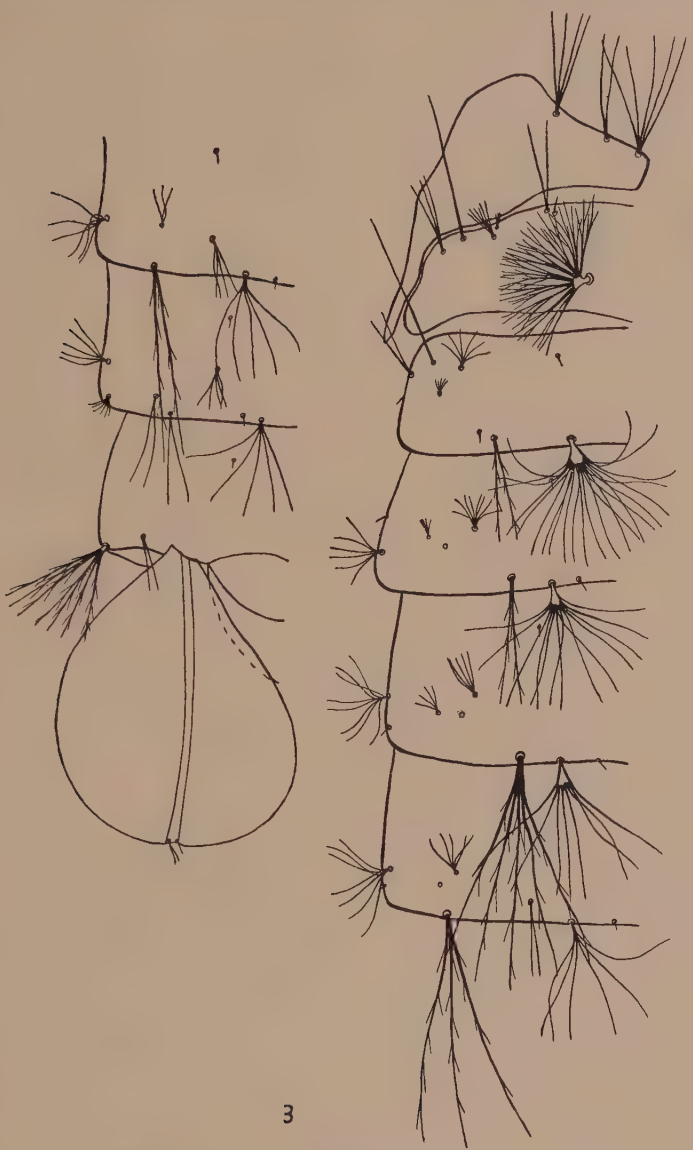

Fig. 3.—*C. tenagius* sp. n., pupa.

Abdomen : tergites very dark brown and with large basal lateral creamy white spots on 2–7 (those on 7 extending to apical margin) and with narrow, straight-edged creamy white basal bands on 3–7 ; sternites covered with creamy white scales. *Legs :* very dark brown almost black. Front coxae covered with blackish scales but sometimes with a few pale scales above. Fore and mid femora all dark anteriorly with the fore femora pale below posteriorly and mid nearly all pale behind ; hind femora creamy white with a full length

dark dorsal line which gradually broadens to fill the whole surface narrowly at apex. All tibiae dark with a pale stripe behind and tarsi dark with the first segment sometimes indistinctly paler below.

Male.—Palpi exceeding proboscis by just about the length of the terminal segment; shaft pale below and along the sides, dark above and with numerous long hairs on the apical one-third; last 2 segments with small patches of yellow scales at bases below or with a line of yellow scales on penultimate segment for full length. Otherwise as described for the female but proboscis paler, being pale for almost the full length below and laterally. *Terminalia* (fig. 2): coxite covered with short fine hairs and with numerous long and short stout bristles on the outside but the tip has few bristles (2 short fine bristles at the base of the style and 1 or 2 on the outside edge). There is a fairly dense patch of long stout hairs on the middle half of the ventral border and a row of about 8 fine hairs on the lower edge of the lobe and an irregular row of a few (6–9 counted) short fine hairs on the inner sternal area below the lobe. Lobe divided, the lower portion having 3 pale rods; the lower rod is straight, narrow and shorter than the other 2 which are stout and curved at tip: upper portion short and with 2 stout bristles, 1 shorter than the other: leaf fairly large and broad and hair *h* stout and curved. Upper division of phallosome very complex with about 6 stout teeth; lower division short and simple: the paraprocts have fairly long arms.

Pupa.—Trumpets short and cylindrical or very slightly widened at tip and with the opening about one-fourth the total length. *Thorax* with hairs 1–9 all about the same length; hair 5 with about 8 branches, 7 usually bifid, 8 with 8–10 branches and the rest 3–4-branched: hairs 10–12 all about the same length with 11 bifid and the other two with 5–6 branches. *Abdomen* (fig. 3): as the pelts are mounted whole and lying on their sides it is not possible to make out the position or form of the hairs on the sternites but they appear to be much as usual for *Culex*. Hairless setal ring O is present on tergites III–V. Hair 7 is long and single on tergites I–II and a short tuft of 6–8 branches on the other segments. Hair 8 is a minute single seta on tergites I–VI and has about 7 short branches on the seventh tergite. *Tergite I:* hair 2 a tuft of about 8 dendrific branches; 3 very short and single; 4 about five times the length of 3 and bifid; 5–6 short, multiple branched setae; 10 shorter than 7 and trifid. *Tergite II:* Hair 2 about the length of the segment and with 26–31 fine branches; 3 short, fine, single and close to 4 which is about the same length as 2 and with 2–3 sparsely plumose branches; 5 with about 6 short branches; 6 a short tuft of about 8 branches; 10 shorter than 7 and bifid. *Tergites III–VII:* Hair 2 with 13–17, 7–10 and 5–8 branches on III, IV and V–VII respectively; 3 a single short seta internal to 2 on III–VI and external on VII; 4 single or with 2–3 very sparsely plumose branches on III and about the same length as 2, on IV it is longer than the preceding segments, sparsely plumose and with 3–4 branches and on V–VII it is shorter than 2 and with 3–7 branches; 5 is a short tuft of 8–9 and 5–6 branches on III and IV respectively and is a long very sparsely plumose seta with 2–3 and 1 or 2 branches on V and VI respectively and on VII it is bifid and about the same length as 2; 6 is a short tuft of 4–6 branches on III–VI and has 2–3 branches which are about the same length as 5 on VII; *Tergite VIII:* hair 8 about one-third the length of the paddles and with 7 plumose branches which are sometimes divided again beyond the base; hair 5 bifid. *Paddles* pale, short, rounded, with no external buttress and a smooth apical edge; hair 7 single, 8 bifid and both very short.

Larva.—The larva is very similar to that of *lacticinctus* but is easily separated on the character of the subventral tufts which have few branches.

Head: antennae infuscate beyond the tuft and narrowly at the base, stout, about half the length of the head, only slightly curved and spiculate even beyond the tuft; tuft of 20–22 plumose branches at two-thirds. Setae A, B and C plumose and with 6–7, 3–4 and 3–4 branches respectively; *d* long and single and *e* and *f* with 3–7 branches (*f* usually with the more numerous branches). Mentum small and with 7 teeth on either side of the

central tooth. *Abdomen* (fig. 4): comb a patch of 34–46 small, fairly coarsely fringed scales. Siphon with an index of about 5½ (5·3–6·2) in whole larvae, light brown in colour and only slightly tapered; pecten of 8–12 pale spines reaching to about one-fifth, each spine with 6–8 ventral denticles extending to the tip (when lying flat the spines appear broad and curved and the last one or two denticles are large and deep giving the tip of the

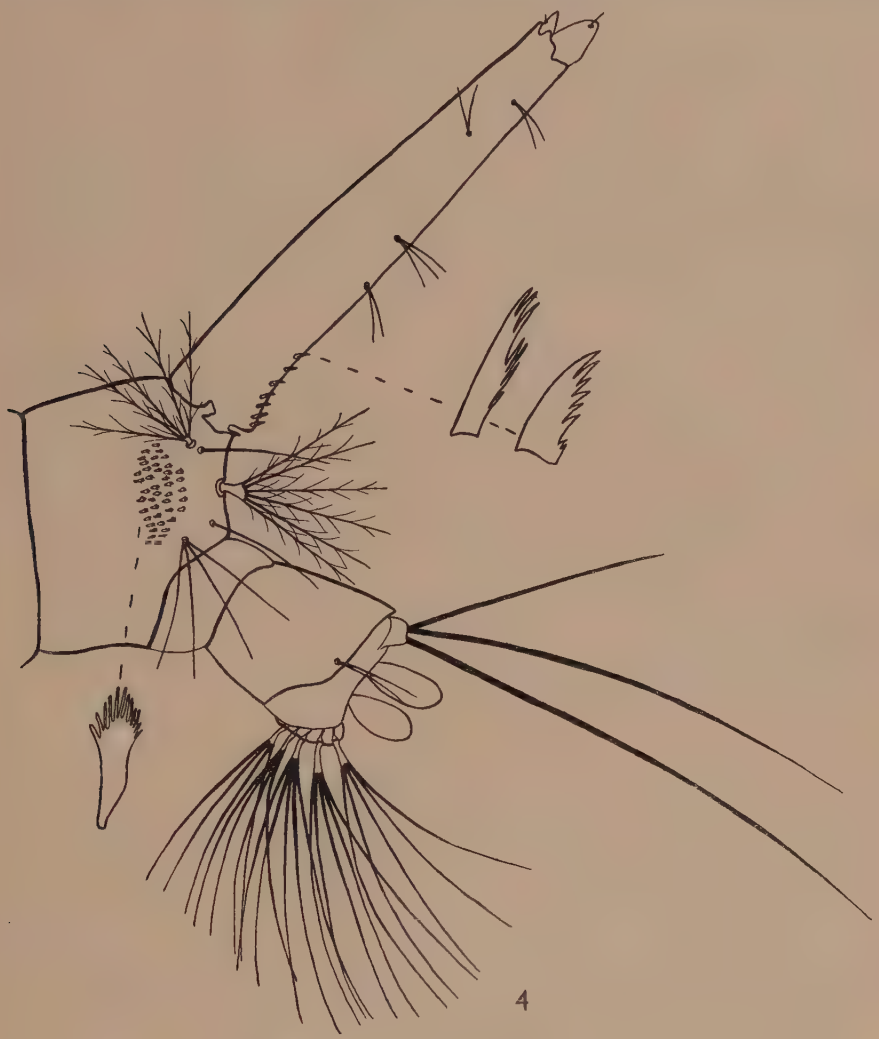

Fig. 4.—*C. tenagius* sp. n., larva.

spine a bifid or trifid appearance); three subventral tufts placed close to the mid ventral line usually have 2–3 simple branches but one or two may be single and the first is placed well beyond the distal end of the pecten and the last is well separated from the others; there is a lateral seta just before the last subventral tuft which is about the same length as the tuft, 2–3-branched and simple. Saddle complete, dark brown and the lateral seta has 2–3 simple branches and is about half the length of the saddle; lower caudal seta single and upper usually with 2 but sometimes 3 branches. Brush with 6 pairs of many-branched setae in the barred area. "Gills" very short and rounded.

Note.—Bwamba, the type locality of *C. tenagius* sp. n., has been described by Haddow (1945) and the mosquitoes of this area have been recorded by the same author (Haddow *et al.*, 1951). In the second paper a note on what are probably undescribed species (p. 236) refers to a mosquito " resembling *C. pipiens* in colour and ornamentation . . . " The mosquito referred to is probably *C. tenagius* sp. n. described above, and the discovery of this mosquito brings the Bwamba list to a total of 161 forms.

Of the Bwamba material 3 males and 1 female and all the larvae were collected by Professor L. C. Beadle of Makerere College, Kampala, Uganda. The adults were bred from the larvae which were taken from saline water near the hot springs at Mongiro. The rest of the Bwamba material was collected at Sempaya by Mr. J. O. Harper, Medical Department, Kenya, and the Nakuru specimens were collected by Mr. Murphy, Chief Health Inspector, Nakuru Municipality, Kenya. In Nakuru adults of this mosquito are often found in houses and labour lines where they are said to bite freely and a few mosquitoes caught while probing on a human arm were identified as *C. tenagius* sp. n. It seems probable that Lake Nakuru, which has a high soda content and is about 3 miles south of the township, is the breeding place of this mosquito in the Nakuru area. So far no larvae have been found in the lake but adults were frequently caught in the vegetation along the lake edge.

Described from the type male, 6 other males, 4 females, the paedotypes and 3 other larval and pupal pelts and 30 whole larvae from Bwamba, Toro District, Uganda and 7 females and 1 male from Nakuru, Kenya. Other larvae of this species were taken in May, 1942, from an open sunny pool (containing 4 per cent. Na_2CO_3) on the shores of Lake Magadi, Kenya.

The nomenclature used for describing the pupae is that of Knight and Chamberlain (1948).

The types and paedotypes of the mosquitoes described here will be presented to the British Museum.

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FURTHER RECORDS OF EAST AFRICAN TERMITES—II.

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Termitidae.

Microcerotermes masaiaticus sp. n.

Imago, Female.—Head chestnut brown, post-clypeus distinctly paler with a dark median line; pronotum as head; abdominal tergites as head, sternites with paler median stripe up to segment VI; legs, brown tibia and femora, yellow tarsi.

Head rather elongate, with broadly rounded posterior and sides diverging; fontanelle inconspicuous; eyes circular, protruding; ocelli small, oval, not more than a short

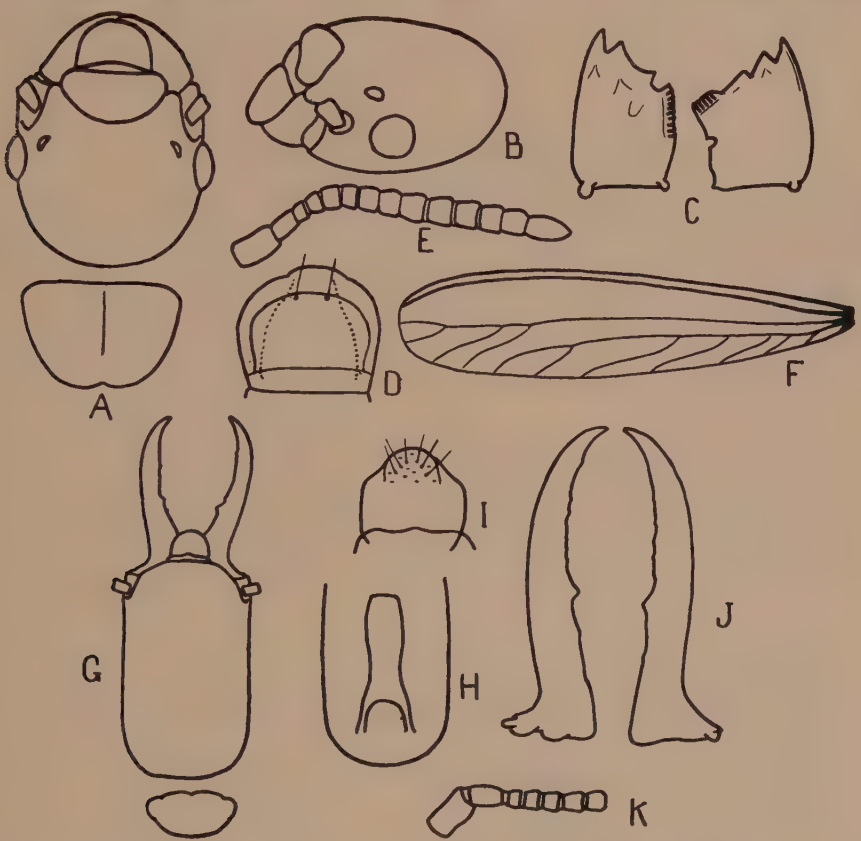


Fig. 1.—*Microcerotermes masaiaticus* sp. n. Imago (A) head and pronotum; (B) head in profile; (C) mandibles; (D) labrum; (E) antenna; (F) fore wing. Soldier (G) head and pronotum; (H) head from below; (I) labrum; (J) mandibles; (K) basal segments of antenna.

diameter distant from the eyes; post-clypeus slightly inflated, anterior margin straight, posterior flatly rounded; antennae with 14 segments, III and IV much shorter than the rest, and sometimes imperfectly separated.

Pronotum narrower than the head across the eyes (10 : 13), anterior margin straight, sides slightly curved, converging to a barely emarginate posterior.

Wings dull brown, with a light covering of small papillae and some setae. Mediana of fore wing with 3 or 4 terminal branches, cubitus with 8 or more branches.

Male.—Generally as female but abdominal sternites without a pale median stripe.

	Female holotype (mm.).	Range (5).	Male.
Width of head across eyes	0·81	0·77–0·84	0·82
Eye, diameter	0·19	—	0·19
Ocellus	0·07×0·05	0·07×0·04–0·06	0·07×0·04
,, to eye	0·05	0·04–0·06	0·04
Width of pronotum	0·63	0·59–0·64	0·64
Length of pronotum	0·42	0·41–0·45	0·36
,, hind tibia	0·85	0·82–0·86	0·86
Fore wing, length	7·8	7·5–8·0	—
,, ,, width	1·86	1·82–1·91	—

Soldier.—Head red-brown, frons darker also margins of antennal pits; labrum red-brown; pronotum buff; abdomen and legs cream to buff.

Head rectangular with short parallel sides and flatly rounded posterior; labrum short and broad with bluntly rounded tip; mandibles long and slender, lightly curved from the base, both inner margins lightly but variably serrate, median tooth on each mandible slightly below half-way, conical; antennae with 13 segments, III smallest, IV and V equal; gulamentum narrow, with constriction near base.

Pronotum with distinctly emarginate anterior, and a flatly curved posterior; anterior corners well rounded.

	Morphotype (mm.).	Range (6).
Length of head and mandibles	2·05	2·05–2·13
,, of head	1·18	1·18–1·28
Width of head	0·77	0·77–0·82
Length of mandibles	0·82	0·82–0·91
Width of pronotum	0·54	0·54
Length of pronotum	0·27	0·27–0·32
,, hind tibia	—	0·73

Worker.—Head pale orange, with darker mandibles and dark spots at the outer corners of the post-clypeus; body cream to buff.

Head with long straight parallel sides and flatly rounded posterior; post-clypeus short and only slightly inflated.

Pronotum a short oval, with slight anterior median notch and unbroken curved posterior; strongly folded along a transverse median line.

Head width . . . . . 0·86 mm.

The alates of this species are darker in colour than *M. parvus*, especially the legs; they are larger than *elegans* and lack a visible fontanelle and a median pale stripe down the abdominal sternites. The soldiers are rather smaller than *parvus*, and have a more rounded posterior margin to the head as well as slenderer mandibles.

Type locality: Kenya: in Rift Valley south of Longonot Mountain, from fallen *Acacia* branch, 6 alates (5 female, 1 male) and one soldier, 14.iii.1950 (*W. V. Harris*, No. 605/2).

Other records.—Kenya: Athi River Falls, near Oldonyo Sapuk, in dead wood of standing tree, 5 soldiers (paratypes), 30.vii.50 (*W. V. H.*, No. 641): Rift Valley near Ol Esagut, 12.ii.50, No. 605; Meru-Isiolo Road, near district boundary, 15.ii.52, No. 813; Namanga, near Tanganyika boundary, 1.xi.50, No. 720; Tanganyika: Ngare Nanyuki, 28.viii.50, No. 708; Tengeru, near Arusha, 30.viii.50, No. 709; Himo Plains, south-east of Moshi, 22.viii 50; Mkombara, 29.v.52 (*P. B. Kemp*, No. K.594).

Holotype, female in British Museum (Natural History).

Morphotype, soldier in British Museum (Natural History).

Biology.—All collections have been made from dead wood, usually of *Acacia spp.* in dry thorn-bush country. No nest was found. Narrow covered-ways made of soil and carton are constructed on the trunks of standing trees to reach suitable dead wood, but more generally old stumps and fallen trunks are entered from below.

All localities fall within the southern part of the dry country which comes down East Africa into central Tanganyika, the country of the pastoral Masai.

Microcerotermes nemoralis sp. n.

Imago, female.—Head chestnut brown, post-clypeus slightly paler with dark median line; pronotum and abdominal tergites light brown, sternites light brown with paler median stripe; legs buff, tibiae darker than femora. Head and body with an even covering of pale bristles.

Head with straight, parallel sides and broadly rounded posterior; eyes large and protruding; ocelli small, oval, a long diameter distant from the eye; post-clypeus flat, with straight anterior margin and almost semicircular posterior; labrum as long as broad, with blunt tip; antennae with 14 segments, I and II cylindrical, III very short and narrow, IV short but as wide as V.

Pronotum not so wide as the head across the eyes (10 : 13), anterior margin slightly concave, sides rounded and converging to widely emarginate posterior.

Wings dull brown owing to dense even distribution of minute stellate papillae, 4–5 pointed, and numerous long bristles, Fore wing with subcosta and radius sector distinct and parallel, other veins less distinct; mediana straight, some distance from the radius-sector except near the base, with short apical branches; cubitus with 10 or more branches.

Male as female, sometimes slightly smaller in size.

	Holotype (mm.).	Range (10, both sexes).
Width of head across the eyes . .	1·14	1·09–1·14
Eye, diameter	0·28	0·25–0·29
Ocellus	0·09×0·06	—
,, to eye	0·08	0·06–0·09
Width of pronotum	0·84	0·77–0·86
Length of pronotum	0·61	0·54–0·64
,, hind tibia	1·20	1·14–1·23
Fore wing, length	.	8·7–9·3
,, ,, width	.	2·5–2·7

Soldier.—Head pale yellow to buff with antennae and labrum similar; mandibles conspicuously dark red-brown. Pronotum and abdomen pale yellow to buff.

Head a narrow rectangle, with parallel sides and rounded posterior, Labrum small, tongue-shaped, rather longer than broad, with pointed tip. Mandibles long and slender with incurved tips, inner margin strongly serrated, exterior basal angle almost a right angle. Gulamentum narrow with sinuate sides. Antennae with 13 segments, III much the smallest, V longer than IV.

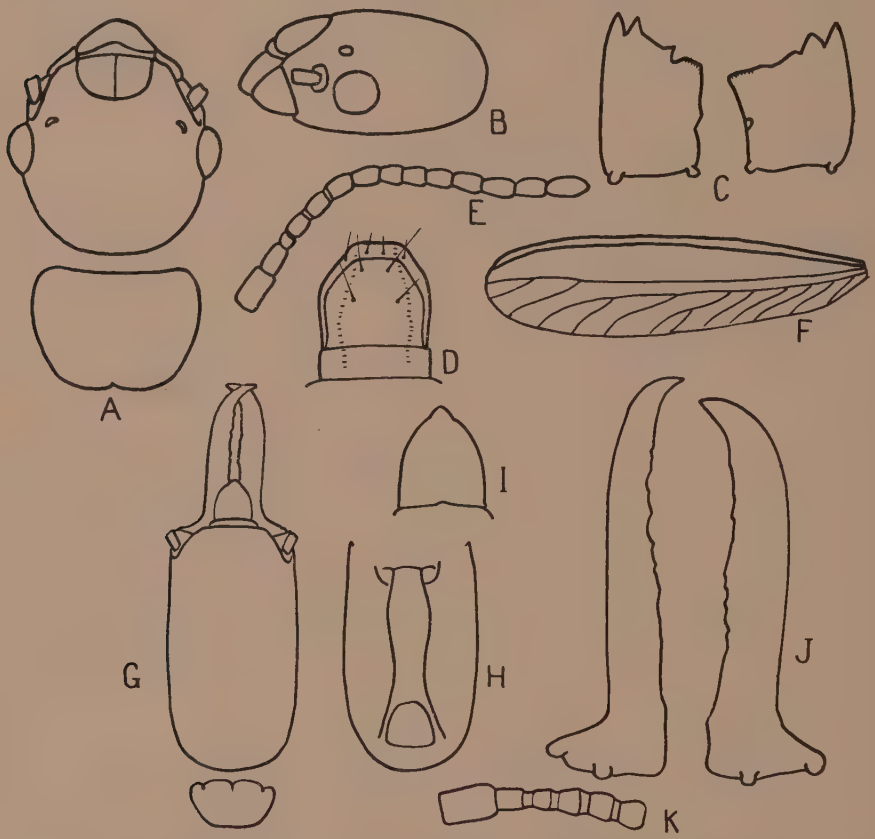


Fig. 2.—*Microcerotermes nemoralis* sp. n. Imago (A) head and pronotum ; (B) head in profile ; (C) mandibles ; (D) labrum ; (E) antenna ; (F) fore wing. Soldier (G) head and pronotum ; (H) head from below ; (I) labrum ; (J) mandibles ; (K) basal segments of antenna.

Pronotum with distinctly emarginate anterior margin, anterior corners well rounded and prominent, sides straight and converging to narrow flat posterior.

	Morphotype (mm.).	Range (3 localities).
Length of head and mandibles . .	3·04	2·82–3·14
,, head	1·77	1·72–1·86
Width of head	1·14	1·09–1·28
Length of mandibles . . .	1·23	1·18–1·32
Width of pronotum	0·65	0·64–0·73
Length of pronotum	0·32	0·27–0·36
,, hind tibia	0·91	0·91–0·95

Worker.—Head pale yellow to buff with prominent dark spots at the anterior corners of the post-clypeus. Head with short straight sides slightly converging to broadly rounded posterior; post-clypeus small, semicircular with straight anterior margin, with fine dark median line, moderately inflated; antennae with 13 segments, the terminal segment pointed.

Pronotum with curved anterior, sides short and strongly converging to narrow posterior; strongly folded upwards along a transverse median line.

Width of head . . . . . 0·98 mm. 0·92–1·09

The alates have a more rectangular-shaped pronotum than *fuscotibialis* and *dolicognathus*, and smaller ocelli than *dolicognathus*. The soldiers are hardly to be distinguished from those of *fuscotibialis* in the absence of alates, the mandibles are generally longer however.

Type locality.—Tanganyika: Kasulu, from a nest in a tree in *Brachystegia* woodland, queen, alates, soldiers and workers, i.35 (*W. V. Harris*).

Other records.—Tanganyika: Uzinza, Kikokoto in hemispherical nest in tree, 18.x.34 (No. 37); Uzinza, Ikena, arboreal nest, 9.ix.37 (No. 271); Tabora, arboreal nest in *Brachystegia* woodland, 24.viii.36 (No. 196); Kakoma 1948 (*P. B. Kemp*). Northern Rhodesia: Abercorn, small round nest in tree, iii.47 (*P. E. Glover*).

Holotype, female, in British Museum (Natural History).

Morphotype soldier, in British Museum (Natural History).

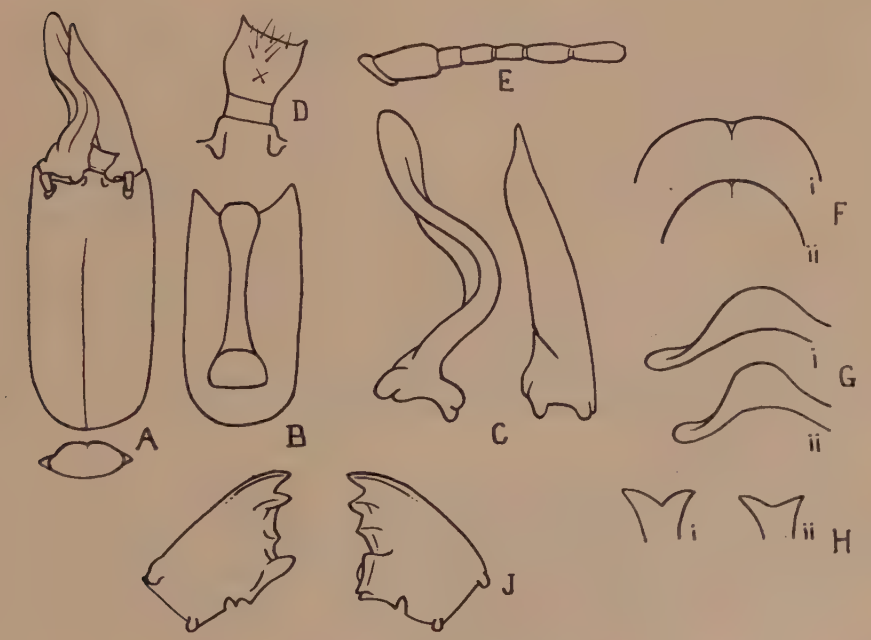


Fig. 3.—*Pericapritermes dumicola* sp. n. Soldier (A) head and pronotum; (B) head from below; (C) mandibles; (D) labrum; (E) basal segments of antenna. Comparison of *dumicola* (i) with *gloveri* (ii), (F) anterior margin of pronotum in profile; (G) left mandible from the side; (H) pronotum from side. Worker (J) mandibles.

Biology.—All collections from arboreal nests, hemispherical in shape, of dark brown carton, attached to the under surface of a large branch or fixed in a fork between two branches. Associated with the *Brachystegia-Isoberlinnia* woodland, which stretches from the southern shores of Lake Victoria through Tanganyika into Northern Rhodesia. In Tanganyika east of the Rift Valley, and at a lower elevation, the carton nests found on trees in the *Brachystegia* woodland are made by a different termite, *Grallatotermes africanus*, with nasute soldiers.

Pericapritermes dumicola sp. n.

Soldier.—Head yellow with a brown median longitudinal line, mandibles dark brown, labrum pale yellow, antennae brown. Pronotum yellow with darker margins, abdomen and legs pale yellow with numerous stout brown hairs.

Head rectangular, twice as long as wide, slightly wider towards the front, posterior flatly rounded; antennae with 14 segments, II and IV equal in length but IV slightly more slender, V longer than III; labrum only slightly asymmetrical, anterior margin straight with pointed corners, sides straight or slightly convex for about half their length, then converging to narrower ante-clypeus; mandibles large and robust, the left folded upwards in the middle with rounded tip, the right flat with a pointed tip.

Pronotum saddle-shaped, anterior and posterior lobes folded upwards at an acute angle, lateral lobes curved downwards; anterior margin with a definite, though small, median notch; posterior margin lightly emarginate, but owing to the edges of the lobes being curled the margin appears to be an unbroken curve.

	Holotype (mm.).	Range (5).
Length of head and mandibles	4·60	4·45–4·63
,, head	2·82	2·73–2·82
Width of head	1·40	1·40–1·46
Length of left mandible	1·91	1·82–1·91
Width of pronotum	0·95	0·86–0·95
Length of pronotum	0·41	0·41–0·45
,, hind tibia	1·28	1·28–1·32

This species is very close to *P. gloveri* from south-west Tanganyika, but differs in being larger, having the left mandible less actutely bent upwards in the middle, having a more symmetrical labrum, and with a distinctive pronotum more acutely folded transversely and with the anterior margin distinctly notched.

Worker.—Small and pale; head oval, with small domed post-clypeus; mandibles as figured; antennae with 14 segments, II, III and IV all rather small.

Width of head	2·09 mm.
Length of hind tibia	0·90 ,,

Type locality.—Tanganyika Territory: Tanga District, Mwakijembe, from small mound on red soil in *Commiphora* woodland, numerous soldiers, workers and nymphal alates, 14.vi.51 (*P. B. Kemp*, No. 251).

Holotype, soldier, in British Museum (Natural History).

Microtermes luteus sp. n.

Soldier.—Head deep orange-yellow, oval, slightly narrower in front; clypeus straight, anterior margin not projecting over the base of mandible; labrum tongue-shaped with rounded tip, and evenly curved sides, reaching beyond middle of mandibles; mandibles

dark brown, outer margin convex, tips strongly curved inwards but not upturned ; antennae 14 segments, III and IV similar and smaller than adjacent segments, V and VI similar and globular ; gulamentum short and broad, with evenly curved sides.

Pronotum with small, pointed anterior lobes divided by an angular median notch ; posterior lobe large and semicircular.

Abdomen and limbs pale yellow.

	Holotype (mm.).	Range (8).
Length of head and mandibles . .	1·48	1·44–1·59
,, head	0·97	0·89–1·04
Width of head	0·85	0·81–1·00
Length of mandibles	0·59	0·59–0·63
Width of pronotum	0·63	0·55–0·65
Length of pronotum . . .	0·41	0·37–0·41
Hind tibia	0·74	0·66–0·78

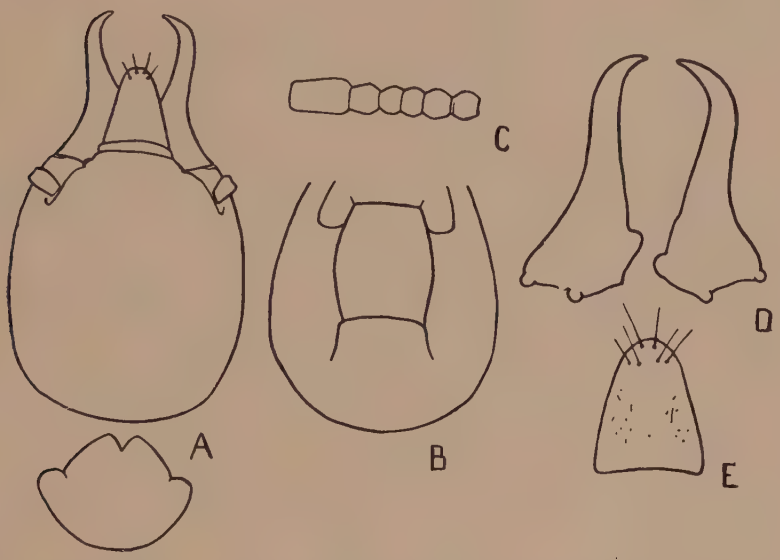


Fig. 4.—*Microtermes luteus* sp. n. Soldier (A) head and pronotum ; (B) head from below ; (C) basal segments of antenna ; (D) mandibles ; (E) labrum.

Worker, major.—Head yellow, generally square with rounded posterior ; clypeus short, distinctly inflated, anterior margin straight, posterior slightly rounded, no median line ; mandibles yellow, with dark teeth ; antennae 14 segments, IV the shortest, V onwards globular ; pronotum with pointed anterior lobes separated by obtuse angled notch. Body and legs pale yellow.

Length of head to tip of mandibles . . 1·30 mm.
Width of head . . . . . 1·07 ,,

Worker, minor.—Similar to major worker except that the head is rounded and the clypeus proportionately larger.

Length of head to tip of mandibles . . 1·00 mm.
Width of head . . . . . 0·81 ,,

Resembles the minor soldiers of *redenianus*, but is much larger, and the mandibles are not upturned at the tips. *M. vadschaggae* has 13-segmented antennae and its head is not noticeably narrower in front. The head of the *luteus* soldier is a deeper yellow than other East African species with oval or ovoid heads.

Type locality.—Tanganyika : Tanga District, Mwakijembe, in log of wood on ground, 25.x.51 (*P. B. Kemp*, No. 341) ; also 12.ii.52 (No. 411).

Other records.—Tanganyika : Kitivo on Umba Plains west of Mwakijembe, in Acacia thicket, 19.v.52 (*P. B. Kemp*, No. 614).

Holotype soldier in British Museum (Natural History).

Nasutitermes kempae sp. n.

Soldier.—Head yellow-brown with darker nose, the colour changing gradually. Head, seen from above, globular with robust nose arising from a broad base ; in profile the upper line quite straight ; hind margin of the base of antenna almost exactly in the middle of the head. Antenna with 13 segments, II and IV approximately equal in length, III and IV slightly longer.

Pronotum with anterior margin an even curve, anterior lobes short, more heavily pigmented than posterior lobe, median lateral line short and pale.

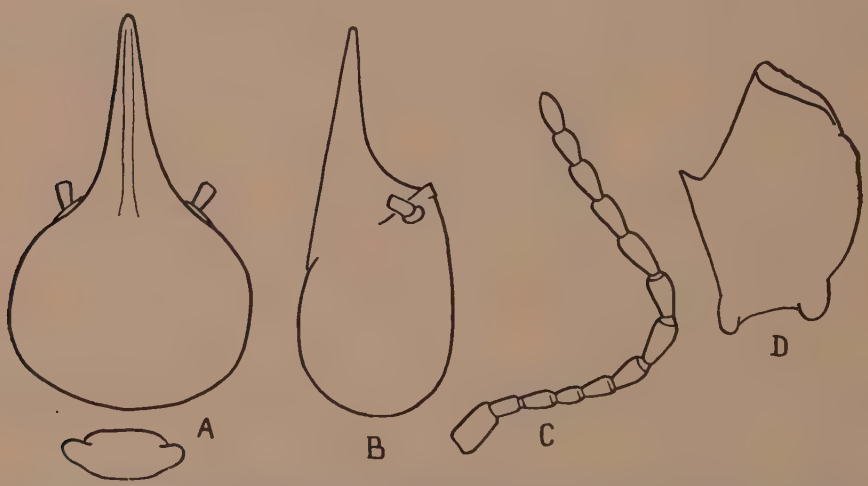


Fig. 5.—*Nasutitermes kempae* sp. n. Soldier (A) head and pronotum ; (B) head in profile ; (C) antenna ; (D) left mandible.

	Holotype (mm.).	Range (5).
Length of head	1·82	1·82–2·05
Width of head	1·14	1·11–1·23
,, pronotum . . .	0·54	0·54–0·64
Length of pronotum . . .	0·23	0·23–0·25
,, hind tibia . . .	1·04	1·04–1·14

Close to *laticeps* but lacks the slight constriction of the head behind the antennae ; larger and more robust than *latifrons*, with shorter antennal segments II to IV and a profile quite flat, not slightly concave.

Worker.—Head broad oval, drab orange colour with pale median longitudinal and transverse lines; mandibles dark brown; antennae with 14 segments.

Prothorax with small anterior lobes, separated by a median notch. Thorax, abdomen and legs pale buff.

Width of head	1·09 mm.
,, pronotum	0·73 ,,
Length of hind tibia	1·14 ,,

Type locality.—Tanganyika Territory: Handeni District, Kwadiboma from earth runs on woodland trees, 6.iii.52 (*P. B. Kemp*, No. 444); from loose earth mound among tree roots, 6.iii.52 (No. 443).

Other records.—Handeni, in dead wood in forest, 8.iii.52 (*P. B. Kemp*, No. 453) and from earth runs on *Brachystegia* trunks, 14.ii.51 (No. 194); Usambara, Luengera Valley, in dead wood in forest, 26.vii.51 (*P. B. K.*, No. 283).

Holotype soldier in British Museum (Natural History).

Grallatotermes africanus sp. n.

Imago, female.—Head dark brown, post-clypeus similar, labrum slightly paler; pronotum brown; abdominal sclerites brown, sternites with paler middle area; legs pale brown; wings opaque, pale brown, with orange stripe below the radius-sector.

Head wider across the eyes than length to front of post-clypeus; frontal area slightly depressed with slit-like T-shaped fontanelle; posterior margin almost a semicircle; eyes large, prominent; ocelli large, elongate oval, almost touching the eyes; post-clypeus short and broad, inflated, anterior margin straight, posterior convex; ante-clypeus wide and conspicuously white; labrum short, broad with rounded sides; antenna with 16 segments, all quite short and rounded, with many short hairs, III longer than II, IV the shortest. Many short pale hairs on head; post-clypeus with two long bristles on the anterior margin; labrum with several long bristles towards the middle.

Pronotum as wide as the head across the eyes, anterior margin straight, sides broadly rounded and sloping to the lightly emarginate posterior; two short divergent grooves near the anterior, and a short median longitudinal ridge towards the posterior. Many short pale hairs.

Abdomen with a uniform covering of short pale hairs over sclerites and intersegmental membrane.

Wings densely covered with minute stellate papillae, and numerous short hairs. Subcosta and radius-sector dark brown and distinct, median and cubitus with only the basal portions pigmented and distinct. Branching of median and cubitus variable.

Male slightly smaller than female, particularly diameter of ocellus and length of wing. The distance of ocellus to eye is greater in the male.

	Holotype (mm.).	Range (4).	Male.
Width of head across eyes	1·68	1·68–1·72	1·68
Eye, diameter	0·59	0·59–0·60	0·64
Ocellus	0·24×0·15	.	0·22×0·13
,, to eye	0·03	.	0·05
Width of pronotum	1·68	1·68–1·72	1·46
Length of pronotum	1·09	1·04–1·09	1·00
,, hind tibia	2·18	2·09–2·18	1·96
Fore wing	17×5·0		15×4·8

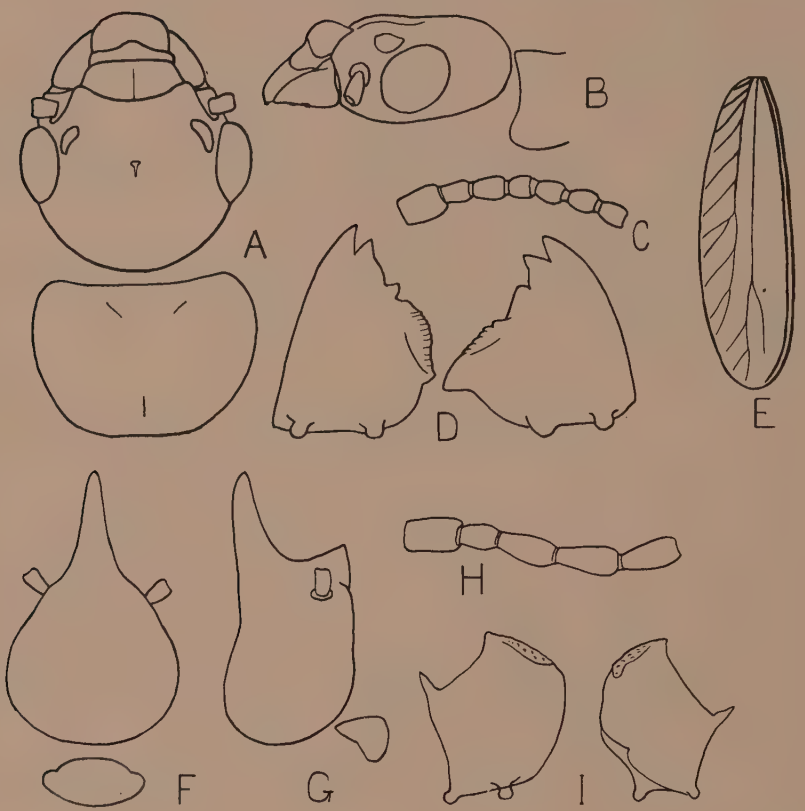


Fig. 6.—*Grallatotermes africanus* sp. n. Imago (A) head and pronotum; (B) head in profile; (C) basal segments of antenna; (D) mandibles; (E) fore wing. Soldier (F) head and pronotum; (G) head and pronotum in profile; (H) basal segments of antenna; (I) mandibles.

Soldier.—Head sepia with a paler transverse stripe between the antennal pits; basal half of nose sepia, remainder red-brown; antennae sepia. Legs and abdominal sclerites pale brown. (It is observed that preserved specimens lose pigment after a few years.)

Head broadly pear-shaped with stout nose arising from a wide base, sides lightly contracted behind the point of insertion of the antennae. In profile the nose slopes away from the head forming an angle of 160 degrees, and the tip curves downwards. Mandibles with distinct sharp points, molar plates chitinised and ridged. Antennae with 14 segments, I, III, IV and V approximately equal in length and twice as long as II.

Pronotum saddle-shaped, anterior and posterior margins flatly curved without emargination, anterior lobe with a median longitudinal furrow. A pale median line down the pronotum continues across the meso- and metanotum.

	Morphotype (mm.).	Range	
		Type nest.	Mafia.
Length of head to tip of nose . .	2·00	2·00–2·05	1·86–1·91
Length of head to posterior margin of antennal pit . . .	1·10	1·10–1·14	1·00–1·09
Width of head	1·28	1·28–1·36	1·23
Depth of head	0·86	0·86–0·91	0·86–0·95
Width of pronotum . . .	0·77	0·73–0·82	0·68
Length of pronotum . . .	0·41	.	0·36
,, hind tibia . . .	2·18	.	1·96–2·05

Worker.—Head sepia, with conspicuous T-shaped pale lines marking the epicranial suture ; clypeus short, colour as head ; inflated ; labrum slightly paler, nearly semicircular, with 4 long bristles ; antennae sepia, 15 segments, all broad and short, III and V equal in length, IV rather longer, II twice as long as III, VI onwards at least as long as II. Pro-, meso- and metanota brown with pale median stripe. Abdominal tergites brown, sternites paler, membrane cream. Major and minor soldiers present.

	Major.	Minor.
Width of head	1·28–1·36	1·04–1·14
Width of pronotum	0·82–0·95	0·68

Differs from *G. admirabilis* Light (Philippines) in having the alates more uniformly dark coloured, and with antennal segment III longer than II, while the soldiers are darker, larger and of only one size. The soldiers are larger than those of *grallatiformis* Holmgren (India) and have 14 antennal segments as compared with 13.

Described from 15 alates and numerous soldiers and workers from type colony, and soldiers from other localities.

Type locality.—Tanganyika Territory : Tanga District, Ngomeni, from an arboreal nest on *Caesalpinia* sp. in coastal woodland, 20.xii.50 (*P. B. Kemp*, No. 100).

Other records.—Tanganyika : Dar es Salaam, arboreal nest, 26.x.36 (*W. V. Harris*, No. 199) ; Mafia Island, v.37 (*W. V. H.*, No. 258) ; Nachingwea vii.50 (*P. E. Glover*). Kenya : Mombasa district, Kwale, vi.50 (*P. B. Kemp*, No. 624).

Holotype, female, in British Museum (Natural History).

Allotype, male, in British Museum (Natural History).

Morphotype, soldier, in British Museum (Natural History).

A NEW SPECIES OF *UNIPTERUS* HALL (HOMOPTERA : APHIDIDAE), AND DESCRIPTIONS OF THE SEXUALES OF *UNIPTERUS PAPILLATA* HALL, 1932.

By J. P. Doncaster, M.A., F.R.E.S.

Unipterus commiphorae sp. n.

Alate viviparous female : Body about 1·5 mm. long, cuticle thin and delicate, bearing short, blunt papillae, each with a single acute apical hair. Head smooth, with a pair of papillae arising from the frons, one at the base of each antenna, and, between and slightly below these, a pair of flattened inconspicuous protuberances. Lateral frontal prominences absent. Ocelli large, the median ocellus surrounded by a ring of thickened chitin which is joined by two chitinous ridges to the thickened borders of the antennal foramina. Frontal hairs fine, acute, $\pm 10\mu$ long. Antennae slightly shorter than the body ; joints I–III dark ; I with its ventral anterior border elongated and projecting forward beyond the base of II ; III sparsely spinulose with 7–13 oval transverse fringed rhinaria in a single row extending over all but the basal quarter of the joint ; IV and V pale with slightly darker apices ; VI with processus terminalis pale and about twice the length of the slightly darker base. Accessory rhinaria grouped closely round the primary rhinarium on VI ; these and primary rhinarium on V fringed with minute hairs. Antennal hairs short ($\pm 6\mu$), acute, and very few in number. Rostrum short, reaching about midway between first and second coxae, apical joint short and blunt with 2 hairs besides the 3 preapical pairs. Mesonotum with a pair of papillae near the posterior margin. Fore wing with pterostigma dark, spinulose, with 4–6 minute hairs, and extending rather more than half the length of the anterior wing margin. Rs slightly curved, dark-bordered ; M, which arises a short distance from Sc, divided into two branches, each dark-bordered and, together with Rs, ending at the posterior wing-margin in a small group of blunt spinules. Cu_1 and Cu_2 are weak and indistinct, but the course of the latter is marked by a band of conspicuous pigmentation. Hind wing with 2 transverse veins, the outer oblique, the inner nearly at right angles to the longitudinal vein. Abdominal cuticle membranous, without markings, bearing short blunt spinal papillae in pairs on each of the first 3, 4, or occasionally 5 tergites ; the papillae become progressively smaller posteriorly. Marginal papillae, which occur on the second, third and sometimes the fourth abdominal segments, are larger and more rounded than the spinal papillae, with a more or less spinulose surface and each bearing a single apical hair. (The pleural papillae, present in the nymph, are absent.) Siphunculi short, smooth, flangeless, with swollen posterior margin. Cauda with an elongate knob, tapering towards the apex and expanded ventrally ; upper surface smooth, under surface with a few spinules and 4 pairs of lateral hairs. Subanal plate divided into two pronounced lobes, spinulose and each bearing about 5 long acute hairs. Rudimentary gonapophyses 4, each with a single hair. Subgenital plate with 2 hairs near anterior margin. Ventral abdominal hairs normal, acute. Fore femora dark and very large, twice as broad as mid and hind femora ; fore tibiae normal, basal third dark. Mid legs small and uniformly pale. Hind legs rather long, thin, dark except basal third of femora. First tarsal joints with 8 hairs. Empodial hairs simple. Two dark bands of pigment on the metasternum partly encircle the points of attachment of the hind coxae.

Nymph (2nd instar) : Body spindle-shaped, cuticle pale and transparent, dorsal surface bearing papillae arranged in two spinal rows from head to abd. VIII, two pleural rows from mesonotum to abd. V, and two marginal rows from head to abd. VII. The marginal

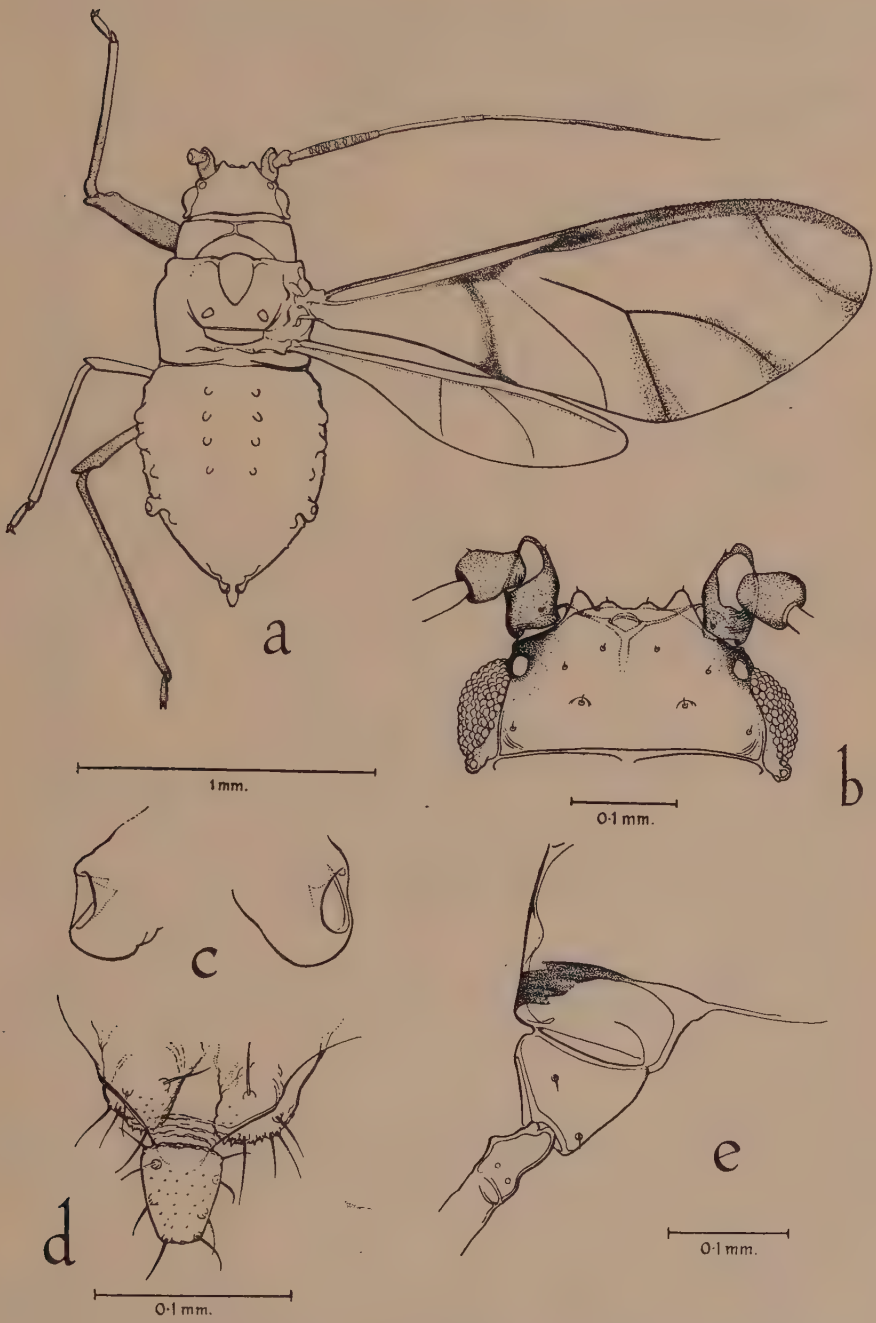


Fig. 1.—*Unipterus commiphorae* sp. n., alate viviparous female: (*a*) whole insect; (*b*) head; (*c*) siphunculi; (*d*) cauda and subanal plate; (*e*) base of left hind leg.

papillae are the largest, with broad conical bases and slightly expanded rounded apices. All have spinulose surfaces, and the apical hairs, if present, are minute and blunt. Antennae of 5 joints, slightly shorter than the body. Compound eye with about 8 facets and conspicuous triommatidion. First tarsal joints with 5–6 hairs.

Measurements of one specimen : Body 1·06 mm., antenna 0·86 mm., joint ratios III–V, 27 : 15 : 10+20, 2nd joint of hind tarsus 0·08 mm., ultimate rostral joint 0·055 mm., longest marginal papilla 0·055 mm.

Measurements of 20 *alate viviparous females* (*in millimetres*).

Holotype.	Body-length.	Antennae (left and right).	Antennal joints III.	IV.	V.	VI.	Siphunculi.	Caudal knob.	Ultimate rostral joint.	Hind tarsus II.	Rhinaria on ant. III.
1	1·44	1·35	0·28	0·29	0·25	0·13+0·26	0·060	0·050	0·070	0·100	8
		1·36	0·28	0·29	0·25	0·13+0·25	0·060			0·100	8
2	1·58	1·46	0·32	0·33	0·28	0·14+0·26	0·060	0·060	0·750	0·100	10
		1·45	0·30	0·32	0·28	0·14+0·27	0·060			0·100	9
3	1·63	1·50	0·32	0·34	0·29	0·14+0·29	0·050	0·060	0·075	0·095	11
		1·50	0·30	0·35	0·29	0·13+0·30	0·050			0·095	10
4	1·52	1·40	0·28	0·31	0·27	0·12+0·26	0·050	0·050	0·070	0·090	9
		1·43	0·29	0·33	0·27	0·13+0·27	0·050			0·090	8
5	1·57	1·43	0·27	0·34	0·28	0·14+0·26	0·050	0·055	0·070	0·095	8
		1·49	0·30	0·33	0·29	0·13+0·28	0·050			0·095	12
6	1·45	1·35	0·29	0·30	0·25	0·12+0·26	0·050	0·055	0·070	0·095	8
		1·42	0·30	0·31	0·26	0·13+0·26	0·050			0·090	9
7	1·54	1·49	0·30	0·32	0·29	0·14+0·27	0·050	0·055	0·070	0·095	11
		1·44	0·30	0·33	0·27	0·13+0·27	0·050			0·095	13
8	1·39	1·38	0·30	0·31	0·26	0·15+0·24	0·060	0·050	0·070	0·095	9
		1·36	0·30	0·32	0·26	0·13+0·22	0·060			0·095	8
9	1·42	1·45	0·30	0·33	0·28	0·14+0·26	0·050	0·050	0·070	0·095	11
		1·45	0·30	0·30	0·29	0·15+0·27	0·050			0·100	10
10	1·62	1·44	0·29	0·31	0·29	0·14+0·28	?	0·055	0·070	0 095	11
		1·46	0·29	0·31	0·30	0·14+0·28	?			0·095	12
11	1·78	1·44	0·30	0·31	0·28	0·14+0·26	0·065	0·060	0·075	0·100	9
		1·42	0·31	0·30	0·27	0·14+0·26	0·065			0·100	9
12	1·54	1·46	0·30	0·33	0·28	0·14+0·27	?	0·055	0·070	0·095	11
		1·46	0·30	0·33	0·27	0·13+0·28	?			0·095	11
13	1·69	.	.	.	.	.	0·060	0·050	0·075	0·095	.
		1·46	0·30	0·33	0·27	0·14+0·27	0·060			0·095	10
14	?	1·45	0·30	0·34	0·29	0·12+0·27	?	0·060	0·070	0·100	10
		1·42	0·31	0·29	0·30	0·12+0·27	?			0·100	9
15	1·53	1·39	0·29	0·32	0·26	0·14+0·25	0·050	0·055	0·070	0·095	9
		1·39	0·30	0·30	0·26	0·13+0·26	0·050			0·095	.
16	1·75	1·47	0·31	0·33	0·28	0·14+0·27	0·050	0·060	0·070	0·095	9
		1·46	0·31	0·33	0·28	0·14+0·27	?			0·095	10
17	1·67	1·52	0·30	0·33	0·28	0·15+0·30	0·050	0·055	0·070	0·095	9
		1·50	0·30	0·32	0·28	0·14+0·29	?			0·095	8
18	1·54	1·40	0·30	0·31	0·27	0·13+0·27	?	0·060	0·065	0·090	11
		1·40	0·29	0·32	0·27	0·14+0·25	0·050			0·090	9
19	1·55	1·45	0·29	0·33	0·27	0·14+0·26	0·060	0·060	0·075	0·100	9
		1·45	0·30	0·32	0·28	0·15+0·25	0·060			0·100	9
20	1·62	1·45	0·30	0·32	0·27	0·14+0·26	0·050	0·060	0·070	0·095	10
		1·46	0·30	0·32	0·28	0·14+0·27	0·050			0·095	9

Nymph (*last instar*) : Numbers and arrangement of papillae as in 2nd instar nymph. Antennae 6-jointed. First tarsal joints with 6 hairs. Measurements of one specimen : body 1·34 mm., antenna 1·16 mm., joint ratios III–V, 22 : 21 : 20 : 12+25. Second joint of hind tarsus 0·092 mm., ultimate rostral joint 0·060 mm., longest marginal papilla 0·085 mm.

Kenya : Nairobi, 6.i.1951, alate viviparous females and nymphs from *Commiphora* sp. (Burseraceae) branches (*G. de Lotto*). The insects were received in a consignment sent for identification to the Commonwealth Institute of Entomology (Coll. no. 12647). Type and paratypes in the British Museum (Natural History).

Systematic position.—Since its erection by Hall in 1932 the genus *Unipterus* has contained only two species, *terminaliae* Hall, 1932 (the type species) and *papillata* Hall, 1932. Both were taken on Combretaceae in Southern Rhodesia. The species here described agrees closely with the generic diagnosis of *Unipterus*, having oval transverse fringed rhinaria, fore wings with once-branched media

and pigmented Cu_2, bilobed subanal plate and knobbed cauda. Its relationships with *terminaliae* and *papillata* are set out in the following table :

	Alate viviparous females.		
	papillata Hall.	*terminaliae* Hall.	*commiphorae* sp. n.
Spinal papillae	Present	Absent (or 1 pair on abd. terg. 8)	Present
Marginal papillae	Present	Absent	Present
Papillar hairs	Clavate	—	Acute
Antenna	Less than ½ body-length	More than ½ body-length	Nearly equal to body-length
Proc. term.	Three-fifths base of VI	± = base of VI	Twice base of VI
Ultimate rostral joint	Longer than hind tarsus II	± = hind tarsus II	Shorter than hind tarsus II
Siphunculi	Annular, truncate	Annular, truncate	Saccate, protruding
Fore femora	Thickened	Normal	Much thickened
Antennal joint I	Normal	Normal	With projecting fore inner angle

In the course of preparing the foregoing description of *Unipterus commiphorae* sp. n., reference was made to Dr. W. J. Hall's type material, some of it unmounted in alcohol, of *Unipterus terminaliae* and *U. papillata*. Nearly all these specimens were either alate viviparous females or nymphs, but amongst the alcohol-preserved material of *U. papillata* were found eight alate males and one incomplete oviparous female. With Dr. Hall's consent, brief descriptions of these hitherto undescribed forms are given below.

Unipterus papillata Hall, 1932.

Alate male : In size and general form very similar to alate viviparous female (*v. Hall*, 1932, p. 51). Antennae about half the body-length, of six joints, the third and fourth often fused. Secondary rhinaria oval, transverse, fringed with minute hairs, irregularly arranged over whole of joints III, IV and V ; III and IV together with 26–34, V with 7–10, and a single secondary rhinarium sometimes present on the base of VI. Joints III and IV sparsely spinulose. Eyes large. Arrangement of spinal papillae much as in alate viviparous female ; i.e., 3 pairs on vertex, 1 pair on pronotum, 2 on mesonotum, 1 on metanotum, and 1 pair on each of abdominal tergites I–VIII. The mesothoracic papillae are the largest, reaching a length of 0·07–0·08 mm. Marginal papillae much less pronounced than in alate viviparous female. Genitalia normal. Other characters as in alate viviparous female.

Measurements of alate males (in millimetres, except rhinarial numbers).

Holotype.	Body-length.	Antenna.	Antennal joints. III.	IV.	V.	VI.	Rhinaria. III.	IV.	V.	VI.	Cauda.	Ultimate rostral joint.	Hind tarsus II.
1	1·43	0·68	0·29		0·13	0·10+0·06	29		7+1	1+1	0·120	0·105	0·100
		0·70	0·19	0·11	0·13	0·09+0·07	18	9	9+1	0+1			0·095
2	1·18	0·66	0·27		0·14	0·09+0·05	26		8+1	1+1	0·105	0·105	0·095
		0·65	0·17	0·11	0·13	0·09+0·06	15	11	9+1	0+1			0·090
3	1·35	0·68	0·28		0·13	0·10+0·05	32		7+1	1+1	0·115	0·100	0·100
		0·68	0·29		0·14	0·10+0·05	34		10+1	0+1			0·100
4	1·16	0·62	0·28		0·12	0·08+0·05	31		9+1	1+1	0·105	0·110	0·100
		0·65	0·30		0·11	0·09+0·05	34		8+1	1+1			0·100
5	1·23	0·68	0·29		0·14	0·09+0·05	34		9+1	1+1	0·100	0·100	0·095
		0·67	0·28		0·14	0·09+0·05	29		9+1	1+1			0·095
6	1·30	0·63	0·16	0·10	0·13	0·09+0·06	17	7	7+1	0+1	0·110	0·100	0·095
		0·65	0·16	0·11	0·12	0·08+0·06	18	11	7+1	0+1			0·095
7	1·30	0·66	0·28		0·14	0·09+0·05	28		8+1	0+1	0·110	0·105	0·100
		0·68	0·20	0·10	0·14	0·08+0·06	18	9	9+1	0+1			0·100
8	1·20	.	.		.	.	.		.	.	0·110	0·105	0·100
		0·63	0·24		0·12	0·09+0·06	28		8+1	0+1			0·000

Oviparous female (description of single specimen): Body 1·36 mm. long, rather slender and elongate. Whole dorsal surface covered with papillae, in size, shape and arrangement very similar to the last instar nymph (*v.* Hall, 1932, p. 52); i.e., long, tapering, spinulose, slightly expanded and rounded apically, with a single minute clavate terminal hair, and (except the cephalic and lateral thoracic papillae which are shorter) varying from 0·06–0·15 mm. in length. The papillae are regularly arranged in pairs; 4 pairs on frons and vertex, and one spinal, one pleural and one marginal pair per segment on thorax and abdomen, except tergite VII which bears spinal and pleural pairs only, and VIII which has only a spinal pair. Head smooth, frons slightly convex, lateral prominences absent. Cephalic hairs short ($\pm 10\mu$), acute. Compound eyes small, triommatidia sclerotic and conspicuous. Antennae missing (except the two basal joints on each side). Rostrum reaching just past hind coxae, apical joint conical, 0·120 mm. long. Siphunculi very short, truncate. Cauda with a broader, more rounded knob than alate viviparous female or male; the bilobed subanal plate with long fine hairs. Behind each siphunculus there is a more or less circular patch of cuticle, about 0·08 mm. in diameter, with a darkened finely granular surface and a small circular central depression or pore. The cuticle immediately surrounding these granular patches is minutely striated. Legs all of approximately equal length and thickness. Pseudosensoria present on all tibiae, mostly confined to the inner surface of the basal two-thirds of the joint, which is scarcely swollen. First tarsal joints of all legs with 7 hairs. Empodial hairs with slightly expanded apices.

Reference.

Hall, W. J., 1932, Some Aphidae of Southern Rhodesia, with descriptions of five apparently new species. *Stylops*, **1** : 49.

A NEW GENUS AND SPECIES OF LAEMOPHLOEINAE FROM THE FIJI ISLANDS (COLEOPTERA : CUCUJIDAE).

By W. O. Steel, F.R.E.S.

In the shape of the head, the insect described below shows a resemblance to the genus *Rhinophloeus* Sharp. It differs markedly from it, however, in the shape of the first antennal segment, the structure of the mouthparts, the much more widely separated anterior coxal cavities, which are completely closed behind (seen from below), and the form of the intercoxal portion of the first visible abdominal sternite.

Rhinolaemus gen. n.

Head produced in front of the eyes as a short, broad, flattened rostrum, the clypeus a little produced and broadly emarginate anteriorly. The eyes rather large, not very coarsely faceted. Ventral head sutures ("gular" sutures) present as two short, well marked, slightly converging lines which commence at about the level of the posterior margins of the eyes and end, each in a small fovea, a little in front of the level of the middle of the eyes.

Antennae with the first segment long, more or less club-shaped, inserted in cavities at the sides of the head.

Labrum prominent, slightly transverse, narrowed towards front, the sides almost straight, the front margin rounded; dorsal surface with a few scattered fine setae, the front margin with a dense fringe of finer shorter setae. Mandibles (fig. 4) long and slender, lightly curved apically, bifid at tip (seen from the side), just behind apex with a small rounded tooth and a little behind this a smaller, more pointed one; prostheca and molar area well developed, the latter file-like. Inner lobe of maxilla (fig. 2) very narrow, of the normal form for the subfamily, the outer much longer and broader, internally (in front of inner lobe) with a dense fringe of fine setae which are longer towards the front, external margin with a few long fine setae. Maxillary palpi very long, the first segment distinctly longer than broad, the second much longer, widened apically, the third a little shorter than the second, widened apically, the fourth slightly longer than the third, somewhat fusiform, rounded apically. Labium (fig. 3) chitinized, as long as broad, broadest at about middle, the anterior margin broadly, somewhat triangularly, emarginate, the sides straight between the anterior margin and the widest part; anterior margin with a few rather long fine setae. Labial palpi very long, the first segment subquadrate, the second considerably longer, slightly curved, rounded apically, the third a little shorter than the second, rounded apically. Mentum strongly transverse.

Prosternal process broad, the anterior coxal cavities closed behind (seen from below), separated by nearly three times their maximum width (seen from below). Intermediate and posterior coxae as broadly separated as the anterior.

Scutellum distinct, transverse, obtusely pointed behind.

Elytra completely covering the abdomen.

First visible *abdominal sternite* long, a little more than twice as long as the second, the intercoxal portion broad, lightly rounded in front, the second to fourth about equal in length, the fifth distinctly longer, nearly twice as long as the fourth.

Legs rather long. Tarsi with the first segment very short, hardly visible from above, the second much longer, longer than the third, the third slightly longer than the fourth, the fifth about as long as the remainder.

Type species: *Rhinolaemus maculatus* sp. n.

PROC. R. ENT. SOC. LOND. (B) 23. PTS. 7–8. (AUGUST 1954).

Rhinolaemus maculatus sp. n. (figs. 1–4.)

Moderately convex, rather shining. Head dark reddish-brown in front, almost black posteriorly, pubescence yellowish, pronotum black, pubescence yellowish inside lateral lines, whitish outside these, scutellum black, pubescence yellowish, elytra black, each with two yellow marks, one near the humerus, the other at the postero-lateral margin, extending forwards towards the suture, pubescence yellowish on yellow marks and around scutellum, black elsewhere. Antennae, mouthparts and legs reddish-brown.

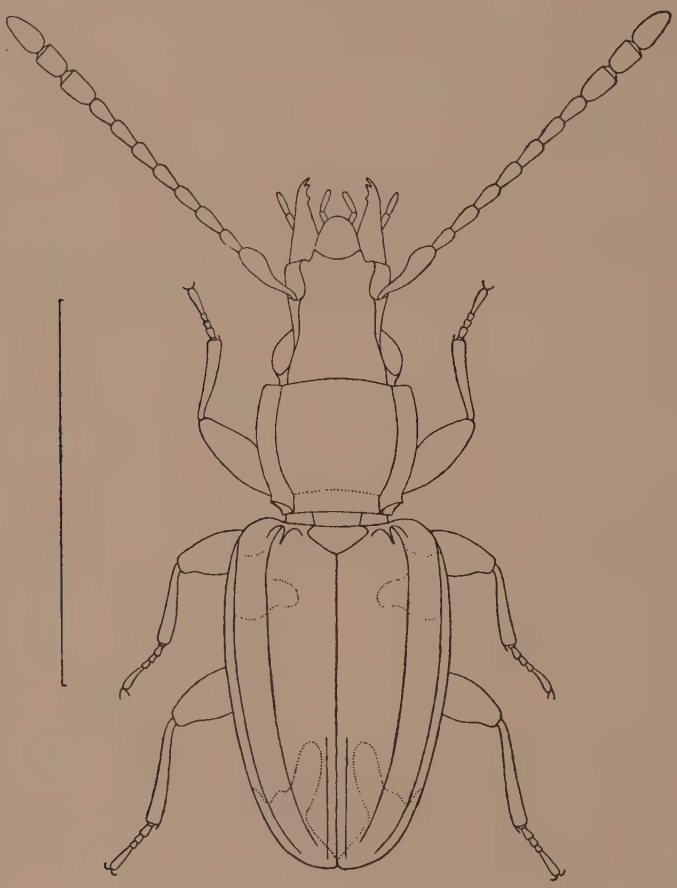


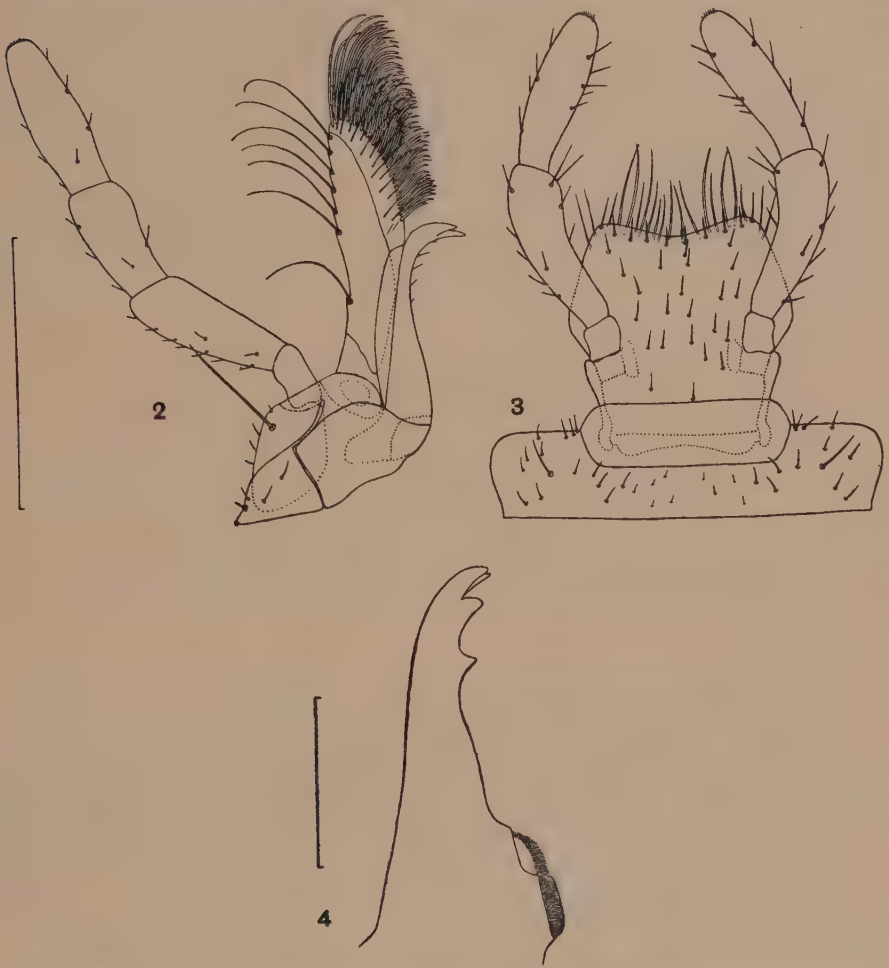
Fig. 1.—*Rhinolaemus maculatus* sp. n., female. (Scale = 2 mm.).

Head broadest across eyes, the ante-ocular portion about one and three-quarter times as long as the eye, the lateral lines well marked. Surface finely and rather closely punctured and pubescent, the punctures a little more diffuse in front of the eyes. Antennae rather long, nearly one and one-quarter times as long as elytra, all the segments longer than broad, the first longer than the next two together, the second shorter than the third, the fourth to eighth about equal in length, a little shorter than the third, the ninth to eleventh longer and broader, forming a well marked club, the tenth distinctly shorter than the ninth and eleventh, the eleventh a little longer than the ninth, bluntly pointed.

Pronotum slightly transverse, about one and one-quarter times as broad as long, broader than the head, broadest in front of middle, the sides rounded until a little in front of base

where they are angulate, anterior margin lightly rounded for the most part, straight on each side between the lateral lines and the anterior angles, anterior angles scarcely rounded, subrectangular, the lateral lines well marked, with a superficial transverse impression between these a little in front of base. Surface finely and rather closely punctured and pubescent, the pubescence a little longer than that on head.

Scutellum punctured and pubescent.



FIGS. 2–4.—*Rhinolaemus maculatus* sp. n. (2) maxilla, (3) labium, to same scale as 2 ; (4) left mandible. The scale in each case = 0·2 mm.

Elytra more than one and one-half times as long as broad, much broader (nearly one and one-half times) than pronotum, the sutural length about one and two-fifths times as long as the pronotum, broadest not far from base, thence narrowed towards apex, the humeri broadly rounded, the sides lightly rounded, the apex rounded. Each with a well marked subhumeral stria and, on about posterior third, a lightly marked sutural one ; not carinate towards the sides, the extreme sides narrowly explanate. Surface about as closely, but much more finely punctured than pronotum, pubescent.

Length : 3·4 mm.

1 female, FIJI ISLANDS : Taveuni, Waiyevo, 27.x.1921 (*Dr. H. S. Evans*). Type in the British Museum (Nat. Hist.).

NEW AND LITTLE-KNOWN AFRICAN LYMANTRIIDAE (LEPIDOPTERA : HETEROCERA).

By C. L. Collenette, F.R.E.S.

The British Museum (Natural History) has received for determination from Monsieur Charles Seydel, of Elizabethville, Belgian Congo, a small but very interesting collection of Lymantriidae, nearly all taken at light. New and unusual species are dealt with in this paper, and a case of male trimorphism is described and illustrated. At M. Seydel's request the types have been sent to the Musée du Congo Belge, Tervueren, while all other specimens have most kindly been presented to the British Museum (Nat. Hist.).

Mr. E. C. G. Pinhey also has sent for determination all the unnamed Lymantriidae of the Coryndon Museum, Nairobi, and a selection of these is included in this paper. I am indebted to Mr. Pinhey for presenting the types and some other selected specimens to the British Museum (Natural History).

Cropera aphanta sp. n. (Plate 1, figs. 1 and 2).

♂. Palpus and frons ochraceous orange, antennal shaft ochraceous buff, pectinations Prout's brown ; thorax ochraceous orange, grading to warm buff on the abdomen. Legs ochraceous orange to ochraceous buff, the outer side of tibiae and tarsi Prout's brown. Upperside of both wings and underside of hind wing on veins, costa and fringe ochraceous buff, between the veins greyer and rather sparsely haired, no trace of a discocellular streak ; underside of fore wing a uniform sepia with a poorly-defined pale streak on the discocellulars, and with costa, inner margin and fringe ochraceous buff.

♀. Colours less bright than in the male, the wings more transparent, fringes light ochraceous buff.

Expanse : ♂, 28–33 mm., ♀, 39–44 mm.

7 ♂, 5 ♀ (including holotype and allotype), Belgian Congo : Elizabethville, ii, iv, v, xi, xii (*Charles Seydel*).

Nearest to *Cropera seminuda* (Hampson), 1910, and having the same shade of buff as this species on the upperside of wings of both sexes. The underside of fore wing in the male is dark with a pale discocellular streak, the female has a narrower fore wing and the male genitalia are very different. The uncus in *C. aphanta* is much shorter and stouter, length about four times the width, as compared with eight times the width in *C. seminuda*. In the former the clasp is short with a regularly rounded apex, much longer in the latter with a squared apex.

Marbla haplora sp. n. (Plate 1, fig. 3).

♂. Distinguished from all other species of *Marbla* by the extension of the dark area on the distal portion of the fore wing, which occupies more than half the area of the wing. The border of this area runs from the costa at just under one-half, slightly oblique inwardly to the lower border of the cell, thence bowed, concavity basad, to the inner margin at one-half. In addition to the usual narrow dark edge to the costa, there is a conspicuous dark subbasal streak along the anal vein to a point half-way across the white area. The dark area in the terminal portion of the hind wing is broader than in other species, running from just above vein 8 to a point on the termen between veins 3 and 4. There is no maize yellow on the wings, the light proximal areas being pure white.

Expanse : 35 mm.

Holotype male, Uganda: Kigezi, Mafuga Rain Forest, 7500–8000 ft., vi.1951 (*T. H. E. Jackson*), ex Coryndon Museum.

This species has vein 8 in the hind wing connected with the cell for a considerable distance, see my remarks on *Marbla* in *Ann. Mag. nat. Hist.* (10), **20**: 607. The genitalia, examined without removal, show specific differences from other species.

Paramarbla beni (Bethune-Baker), 1909.

The type male of this species was taken at Makala, Beni, in the Ituri Forest. Two further males are in the British Museum collection from Wawami, near Beni, and from Amani at 700 miles distance in Tanganyika Territory. These have the spot at the origin of vein 2 in the fore wing and a second in the centre of the discocellulars rounded and black. Formerly separated from these are three males from the Kakamega District and one from Rau, Nandi, Kenya Colony, which agree in having the spots less densely haired and therefore grey rather than black, while the discocellular spot is elongated into two spots at the origins of veins 5 and 6, joined by a few dark hair-scales. The genitalia of the two forms have been compared and no difference found. In the absence of further material all have now been included under *P. beni*.

Euproctis episema sp. n. (Plate 1, fig. 4).

♂. Palpus, antenna, legs and body pale yellow orange to orange buff. Fore wing on upperside pale orange yellow, hind wing on upper and underside and underside of fore wing very slightly lighter; the only markings are a round Mars yellow spot on the centre of the discocellulars, one-third of the discocellulars in diameter, and a still larger spot of the same colour at the centre of the inner margin, the anal vein running through its centre; the two spots are faintly visible beneath.

Expanse: 41 mm.

Holotype male, Belgian Congo: Elizabethville, vii.1951 (*Charles Seydel*).

Related to *Euproctis crocosticta* Hampson, 1905 (Nyasaland, Tanganyika, Mashonaland and Natal), and possibly only a subspecies, but with the dorsal apex of the clasp well rounded and not bluntly pointed as in that species. There is no trace in *E. crocosticta* of the conspicuous Mars yellow spot on the inner margin of the fore wing, but the spot on the discocellulars is similar.

Paraproctis chionopeza sp. n. (Plate 1, fig. 8).

♂. Palpus drab. Antennal shaft whitish, pectinations pinkish buff. Head cream colour. Thorax, abdomen and legs whitish, mixed on patagium and tegulae with Prout's brown. Fore wing with ground-colour white; proximal four-fifths of wing filled in with Prout's brown markings, of which an antemedial and a postmedial fascia are prominent, both being outlined below the cell with narrow borders of white; inner marginal area, excepting for the two fasciae, unmarked and white; distal fifth of wing, and fringe, white, the junction of the white with the brown area being sharply defined and the white entering the brown more deeply between veins 2 and 3 and 5 and 6. Underside of fore wing Prout's brown, terminal and inner marginal areas white, the edges of the dark area almost straight; fringe white. Hind wing, above and beneath, white, with a few Prout's brown scales on the discocellulars and in the apical area; fringes white.

Expanse: 23 mm.

Holotype male, N. Rhodesia: Mpika, ii.1950 (*N. Mitton*), ex Coryndon Museum.

This very interesting insect shows the unusual venation of the genus. In place of veins 6 and 7 of the fore wing, a single vein arises from one-third the stalk of 8 and 9, and in place of veins 10 and 11 a single vein arises from the cell near the angle. By comparison with the other two species in the genus it would appear that veins 7 and 10 are missing. In all three species, veins 6 and 7 in the hind wing are on a long stalk, and vein 8 anastomosed with the cell for a long distance. Although the hair-scales on the basal segments of the abdomen are long and upstanding, the dorsal tufts illustrated in *Entomologist*, 1936, **69** : 179, for *P. calamorpha* Collenette are not present in *P. chionopeza*.

Aroa acrodisca Hampson, 1910.

In species of this genus, females are unusually scarce or unknown and differ widely from the males. A pair of *A. acrodisca*, from the Experimental Farm, Nachingwea Masasi, Tanganyika, xi.1951, (*Dr. A. C. Evans*), ex Coryndon Museum, includes the first female of the species. The ground-colour of the wings follows that of the male, but light markings are entirely absent on both upper and underside. Apart from a very faint postmedial fascia on the fore wing, the only indication of the bold pattern of the male is a narrow dark terminal line to both wings. Expanse: ♂ 27 mm., ♀ 30 mm.

Hemerophanes Collenette, 1953 (*Dasycampa* Janse, 1915 praeocc.).

Specimens in the Seydel collection throw light on the species in this genus, and provide the only instances in the family of trimorphic males. It has now also become possible to pair off males with the very differently marked females, and to revise the relationship between described forms and species. Very opportunely, a bred series of three males, three females of *H. enos* (Druce) has been received from D. G. Sevastopulo of Kampala, and this is referred to below.

Janse stated that his genus *Dasycampa* (type *flammeola* (Distant), 1899) strongly resembled *Dasychira*, giving as the chief difference that there was only one pair of spurs on the hind tibia. However, specimens of both sexes, since examined in the British Museum, prove to have two pairs, and Janse either examined an abnormal specimen or was in error. The genus may be maintained on the narrow pointed wings and bifid uncus of the male, coupled with the strong difference in appearance between the two sexes. The following notes cover the species in the genus.

Hemerophanes flammeola flammeola (Distant), 1899.

Dasycampa ianthina Janse, 1915, *Ann. Trans. Mus.* **5** (1) : pl. 3, figs. 3 and 4, ♂ and ♀ ; venation, etc., pl. 5, figs. 1*a*–1*g*, South Africa.

Hemerophanes flammeola libyra (Druce), 1896.

The female is illustrated in Seitz, *Grossschmett. Erde*, **14**, pl. 22g. The insect is now shown as a subspecies, and is apparently the East African race of *H. f. flammeola*, from Tanganyika, Nyasaland and Rhodesia. Males are darker, with a larger white patch at the tornus, while females normally have larger dark patches at apex and on basal half of inner margin of fore wing. Genitalia

in both sexes are hardly distinguishable from *D. f. flammeola*. The male uncus is bifid, having two short horns arising from its apex ; the aedeagus curves to an angle of 90°, while the clasp has a harpe divided into a main portion and a thin curved subsidiary portion.

Hemerophanes enos (Druce), 1896.

Dasychira acerata Collenette, 1939 (French Guinea, W. Africa). **Syn. n.**
Dasychira cedestis Hering, 1926 (Spanish Guinea). **Syn. n.**

H. enos was described from Old Calabar, W. Africa. The species is illustrated (♂, as *acerata*), in *Ann. Mag. nat. Hist.* (11) **3** : pl. 2, fig. 16, and (♀, as *cedestis*), in Seitz, *Grossschmett. Erde*, **14**, pl. 24*a*. *D. cedestis* was described from what appears to have been a rather extremely marked female of the species, while *D. acerata* was the male, very different in appearance from the female and not previously recognised. The male uncus is bifid with two long curved horns from its apex ; the aedeagus not strongly curved ; the clasp having a very long and slender harpe, curved into a semicircle. The British Museum (Natural History) has received 3 males, 3 females bred in February, 1953, at Kampala, Uganda, by D. G. Sevastopulo. The terminal band on the hind wing of the female is 2 mm. broad in one insect and less than half that breadth in the two others.

Hemerophanes hypoxantha (Holland), 1893.

The type female is in the Carnegie Museum, Pittsburgh, and comes from the Ogove River, W. Africa. The male is unknown. In the British Museum (Natural History) are two females which answer to the description of the species, having the termen of the fore wing slightly concave. There is no marking on the hind wing, and both genitalia and fore wing markings appear to indicate a distinct species allied to *H. enos*.

Hemerophanes diatoma diatoma (Hering), 1926.

The type male is from Usambara, Tanganyika, and is illustrated in Seitz, *Grossschmett. Erde*, **14**, pl. 25*c*. The female is unknown. In the British Museum (Natural History) are three males, one from Zanzibar, undated, and from Kigoma, Tanganyika and Mt. Mlanje, Nyasaland, both taken in March and all of this form. There is a further male, from Lilongwe, Nyasaland, taken in February and now illustrated (Plate 1, fig. 12), which appears to represent a dimorphic form. For reasons discussed below under *H. diatoma triphyes* subsp. n., it is considered probable that intermediates do not usually occur, and it is now named as form **xanthisma**, the description following :

Ground-colour of fore wing light ochraceous buff, pattern as in the dark form, but less strongly marked, the patch on the discocellulars ochraceous orange, other markings ochraceous buff, grading to Prout's brown in the inner marginal area ; hind wing above and beneath, underside of fore wing, and fringes, unmarked, antimony yellow. Genitalia as in the dark form ; uncus broad with a pair of long, slightly curved horns from the apex ; clasp long, thin and rod-like, curved near the base, with a harpe of three-fourths the length and somewhat the same shape ; a pair of long thin lobes to the anellus ; the genitalia are therefore remarkable in having four pairs of long and thin rod-like stalks of approximately similar appearance. Saccus bluntly pointed and triangular. Expanse of both forms, 36–41 mm.

Hemerophanes diatoma triphyes subsp. n. (Plate 1, fig. 13.)

In the Seydel collection is a series of 16 males, 1 female, all taken at Elizabethville, Belgian Congo, expanse ♂, 43–47 mm., ♀ 52 mm. Four of these males, corresponding to the dark form of *H. d. diatoma*, but larger and still darker, were taken from 6th to 13th April, 1953. Six males, one female, with an unmarked antimony yellow hind wing and a fore wing of a lighter tint of brown above and considerable area of mummy brown below, were taken in January, April, May and August; these are now named as form **xanthopa** (Plate 1, fig. 10). A further female of this form is in the British Museum (Natural History) from Solwezi, N.W. Rhodesia, taken in November. Six further males, taken in March and April, have a fore wing as in form *xanthopa*, and a hind wing and fringe of antimony yellow above and beneath, with a broad terminal band of mummy brown, and these are now named as form **percopeza** (Plate 1, fig. 14). Male genitalia are identical in the three forms. The saccus is bluntly pointed and about twice as long as wide, differing in this respect from the smaller *H. d. diatoma*, which has a saccus equilateral in shape. An example of each of the three forms is now illustrated. This is the only clear-cut case of trimorphism known to me in the Lymantriidae. Males of each were taken between 6th and 11th April, and it is most unlikely that they are seasonal. Monsieur Seydel states that all were taken at light, and remarks that he has always regarded them as belonging to one variable species.

Hemerophanes diatoma stenoptera (Hering), 1926.

Described from Spanish Guinea, W. Africa, from a single male. It is illustrated in Seitz, *Grossschmett. Erde*, **14**, pl. 25c, and is no doubt the West African race, as stated by Hering.

Hemerophanes larvata (Schultze), 1934.

Described from a single male from Mongoumba, N.W. Belgian Congo. It is illustrated in *Iris*, **48** : pl. 1, fig. 5, and may be, as stated by Schultze, nearly related to *H. d. stenoptera*.

Dasychira Stephens, 1809.

Some insects in the Seydel collection belong to a small group of species in the genus *Dasychira* characterised in the males by a straight dark antemedial fascia in the fore wing, and in the genitalia of some species by an extremely long aedeagus and saccus, over three times the length of the remainder of the genitalia. The females have a very differently marked fore wing from the respective males and a darker hind wing.

The male genitalia in the following six species and forms are similar but show considerable individual variation, so that on the evidence of numerous preparations they are unreliable as a guide to species. However, the teeth on the aedeagus and the shape of the tegumen dorsally might give scope for further work when long series are available. In some species the females are now linked with the males for the first time. Brief notes on each species in the group now follow, with synonymy.

Dasychira rocana Swinhoe, 1906 (Plate 1, fig. 16).

Dasychira basilinea Hering, 1926. **(Syn. n.)**

Recorded from the Gold Coast, French Guinea, Cameroons, Angola, Natal, Mozambique, Uganda and Belgian Congo. In the male, the area from the base of the fore wing to the straight antemedial fascia is forest green mixed with white, giving a light grey-green appearance. Welcome proof of the identity of the female is given by 3 males, 2 females (including neallotype), bred by Charles Seydel, Elizabethville, xi.1948 (see figure), in which the grey-green colour is replaced by drab, the antemedial fascia only faintly indicated and the distal third of the hind wing Saccardo's umber.

Dasychira rocana pseudosatanas Hering, 1926. **(Status nov.)**

From Uam district, French Equatorial Africa. Three males from Fort Crampel in British Museum. Markings as in *D. rocana* but basal area snuff brown to bistre, matching remainder of wing. Expanse ♂ 30–33 mm., ♀ unknown.

Dasychira extatura Distant, 1897.

Dasychira satanas Hering, 1926. **(Syn. n.)**

From Transvaal, Mozambique and S.W. Africa. The differences in markings on which *D. satanas* was founded are individual only, this having become apparent from a considerable series now available from the type locality. Males have a brown apical spot on the upper side of the hind wing, a smaller spot in the anal angle and usually a spot on the discocellulars.

Dasychira nubifera Holland, 1893.

From Nigeria, Ivory Coast, French Guinea, Cameroons and Angola. The fore wing in both sexes has a faintly greenish tinge, and the male has similar but heavier markings on the hind wing to *D. extatura*.

Dasychira nubifera obliquilinea Fawcett, 1915. **(Status nov.)**

From Kenya and Uganda. Apparently the East African race of *D. nubifera*.

Dasychira lulua Collenette, 1937.

From the Belgian Congo. The hind wing of the male is dark and unspotted on the upper side.

Dasychira atrifilata Hampson, 1905.

From Mashonaland, Rhodesia and Tanganyika. This species and the four species and forms which follow possess markings in both sexes which resemble those discussed above, but with very different male genitalia. The antemedial fascia in the male is again straight and dark, and the hind wing light in male and dark in female. The male genitalia have saccus and aedeagus of normal length, and a short uncus as long as broad.

Dasychira atrifilata embrithes Collenette, 1933. **(Status nov.)** (Plate 1, fig. 9).

From N.W. Rhodesia, Belgian Congo and Tanganyika, described from females.

In the Seydel collection are 2 males, 2 females from Elizabethville, Belgian Congo, in which the male genitalia cannot be distinguished from those of *D. a. atrifilata*, but having a darker and browner fore wing, a patch of ochraceous tawny on the discocellulars and a stronger subterminal fascia on the fore wing. The females agree with *D. embrithes* from N.W. Rhodesia. A male is now designated as neallotype, and *D. embrithes* now reduced to a subspecies of *D. atrifilata*.

Dasychira atrifilata hyphasma Collenette, 1936. **(Status nov.)**

Described from a single Angolan male. The genitalia differ from those of *D. a. atrifilata* only in small details which are probably individual. The expanse is much less, the hind wing darker, and small differences in pattern are well illustrated in the original illustration. The species is now reduced to a subspecies of *D. atrifilata*.

Dasychira glovera Swinhoe, 1906.

Dasychira gloveroides Hering, 1926. **(Syn. n.)**

D. glovera Swinhoe occurs in Uganda and Hering apparently had not seen the species. *D. gloveroides* was described from Spanish Guinea and agrees with Uganda specimens.

Dasychira omissa Hering, 1926.

From Ivory Coast, Gold Coast, Dahomey and Cameroons. Known from females only and probably only a heavily marked form of *D. glovera* Swinhoe.

Dasychira thika sp. n. (Plate 1, fig. 5.)

♂. Palpus pinkish buff mixed with fuscous. Antennal shaft pale pinkish buff, pectinations fuscous at base, distally lighter. Legs, head and thorax pale pinkish buff mixed with drab. Abdomen whitish. Fore wing drab; an irregular fuscous subbasal fascia; an antemedial and a postmedial fascia, fuscous, broken at the veins, bowed (convexity basad) from cell to inner margin, doubled along the discocellulars; a fuscous preterminal fascia composed of interneural streaks; fringe drab, lighter at the veins-ends. Underside of fore wing and fringe drab, paler in the inner marginal area. Hind wing and fringe, above and beneath, whitish.

Expanse: 35 mm.

Holotype male, KENYA: Thika Road, iii.1952, (*E. Pinhey*), ex Coryndon Museum.

Nearest to *D. atrifilata* Hampson, 1905, from Mashonaland, Rhodesia and Tanganyika. In the present species veins 3 and 4 and 6 and 7 in the hind wing are on long stalks, in *D. atrifilata* 3 and 4 are from a point and 6 and 7 on a short stalk. The third segment of the palpus in *D. thika* is half the length of the second segment, much shorter in *D. atrifilata*; the postmedial fascia in *D. thika* is straighter and appears to run through the discocellulars, not curved distally round them, and the preterminal fascia in *D. thika* is clearly broken at the veins, not continuous. The male genitalia show affinities but very distinct differences.

Euproctidion periblepta sp. n. (Plate 1, fig. 6.)

♂. Palpus white. Antennal shaft white with sparse Prout's brown markings, pectinations buckthorn brown. Head, thorax and abdomen white to light buff, dorsal tufts of buffy brown on basal segments of abdomen with slight admixture of apricot buff. Pectus and legs whitish, mixed on the legs with Brussels brown, the shafts of femora and coxae of fore and middle legs scarlet. Fore wing Brussels brown, veins lighter with an admixture of orange buff to scarlet and each edged on both sides with a narrow line of fuscous ; a white basal patch, and a prominent white medial fascia, broader towards costa and inner margin, curved, convexity basad ; three small white markings at regular intervals on the costa in the postmedial area ; a white preterminal fascia, broadest at apex, crescent-shaped between the veins, with concavities terminad ; fringe pinkish buff, white at the vein-ends. Underside of fore wing lighter, with principal upperside markings faintly indicated. Hind wing above and beneath white, fringe whitish ; termen on upperside narrowly marked with cinnamon buff, costal area on lower side irrorated with Brussels brown.

♀. Resembles the male, but with veins on upperside of hind wing faintly marked with peach red.

Expanse : ♂ 31 mm., ♀ 37 mm.

Holotype male, allotype female, Belgian Congo : Elizabethville, vi.1952 and v.1953 (*Charles Seydel*).

This beautiful insect is nearest to *E. striata* Collenette, 1931, but the male genitalia indicate specific distinction. The uncus is thin and long, about seven times the width at base. In *E. striata* the uncus is short, narrowing towards the apex, with well-defined shoulders at the base and approximately as long as broad. The wing pattern is somewhat similar, but the orange buff to scarlet on the veins of the fore wing is absent in *E. striata* and the broad white medial fascia represented only by a few whitish markings.

Terphothrix seydeli sp. n. (Plate 1, fig. 11.)

♂. Palpus white, on the outer side Brussels brown. Antenna cinnamon buff. Head white ; thorax and abdomen cinnamon buff mixed with sayal brown and Brussels brown ; tegulae, and abdomen dorsally, with tufts of spatulate hair-scales, cinnamon buff with darker tips. Legs, pectus and venter white, the tarsi marked distally with Brussels brown. Fore wing cinnamon buff to sayal brown ; a small white spot at the origin of vein 5 ; a faint buckthorn brown postmedial fascia, curved, concavity terminad, between vein 5 and the anal vein ; some bistre shading in the subterminal area and a subterminal fascia of the same colour, parallel with the termen, broken at the veins ; a prominent xanthine orange apical patch, within which are two triangular white spots ; fringe cinnamon buff. Hind wing white, with a broad terminal border of bistre, extending to the costal area and fringe. Underside of fore wing and fringe Brussels brown, the area from lower margin of cell and vein 2 to inner margin white, and two triangular white spots at the apex. Underside of hind wing white, apical area and fringe Brussels brown.

Expanse : 31 mm.

Holotype male, Belgian Congo : Elizabethville, vi.1951 (*Charles Seydel*).

This insect is of considerable interest, and very different in general appearance from any other Lymantriid. It is named after Monsieur Charles Seydel, who has obtained many unusual Lymantriidae in the neighbourhood of Elizabethville. The specimen has somewhat similar markings on the apex and termen of the fore wing to *T. tenuis* (Holland), 1893, but has a broad dark

border to the upperside of the hind wing. Long spatulate hair-scales dorsally on the abdomen are more strongly developed than in the other two species of the genus, both of which are from West Africa.

Aclonophlebia civilis Hering, 1926. (Plate 1, fig. 7.)

This species was described from a single male taken in Tanganyika, and there is a further male in the British Museum collection from Lumbwa, Kenya Colony. In the Seydel collection are 2 males, 2 females (including neallotype) from Elizabethville, Belgian Congo, April, June and August. The female follows some other species of the genus in having the same markings as the male, but a slightly duller fore wing and a hind wing shaded with drab grey, darker towards the termen. Expanse, Belgian Congo specimens, ♂ 36–37 mm., ♀ 46–47 mm.

Palasea melissa (Fawcett), 1915. (Plate 1, fig. 15.)

This species was described from Masongoleni, Kenya Colony, the type being a female, although referred to in the description as a male. Large numbers of females have since been collected from adjacent areas. In this genus the two sexes are sometimes dissimilar, and it is therefore of particular interest to find a male of the species in the Coryndon Museum material, collected at Machakos, east of Nairobi, iii.1951 (*B. T. Parson*). The wing markings exactly follow those of the female, but on the broad terminal borders of both wings the amber yellow is replaced by cream colour. The pink of the hind wing is superseded by this same pale cream colour, although a certain degree of fading in the specimen is possible. Expanse : 38 mm.

PLATE I.

Fig. 1.—*Cropera aphanta* sp. n., holotype ♂.
Fig. 2.—*Cropera aphanta* sp. n., allotype ♀.
Fig. 3.—*Marbla haplora* sp. n., holotype ♂.
Fig. 4.—*Euproctis episema* sp. n., holotype ♂.
Fig. 5.—*Dasychira thika* sp. n., holotype ♂.
Fig. 6.—*Euproctidion periblepta* sp. n., holotype ♂.
Fig. 7.—*Aclonophlebia civilis* Hering, neallotype ♀.
Fig. 8.—*Paraproctis chionopeza* sp. n., holotype ♂.
Fig. 9.—*Dasychira atrifilata embrithes* Collenette, neallotype ♂.
Fig. 10.—*Hemerophanes diatoma triphyes* subsp. n., form *xanthopa* nov., type ♂.
Fig. 11.—*Terphothrix seydeli* sp. n., holotype ♂.
Fig. 12.—*Hemerophanes diatoma diatoma* Hering, form *xanthisma* nov., type ♂.
Fig. 13.—*Hemerophanes diatoma triphyes* subsp. n., type ♂.
Fig. 14.—*Hemerophanes diatoma triphyes* subsp. n., form *percopeza* nov., type ♂ .
Fig. 15.—*Palasea melissa* Fawcett, neallotype ♂.
Fig. 16.—*Dasychira rocana* Swinhoe, neallotype ♀.

New and little known African Lymantriidae.

C. L. Collenette.

Adlard & Son, Ltd., Dorking.

ON THE STATUS OF *BLONDELIA NIGRIPES* FALLÉN AND *BLONDELIA PINIARIAE* HARTIG (DIPTERA: TACHINIDAE).

By H. F. van Emden.

For a long time *Blondelia piniariae* Hartig has been treated as a synonym of *Blondelia nigripes* Fallén, but various facts have come to light during studies on the biological control of caterpillars in North America, which induced Dowden and Sellers to revive the name *B. piniariae*. The biological and morphological differences between the two forms, according to P. B. Dowden (1933), are the following: Although *B. nigripes* completes three to four generations each summer in a fair variety of host species, it seems less effective in the control of its hosts than *B. piniariae* which in nature completes only one generation each year in practically only one species (*Bupalus piniarius* L.). In the case of *B. nigripes* attacking *Porthetria dispar* L., this may be due either to its polyphagous habits, the hairy larvae of *P. dispar* not being a preferred host, or to the fact that the last generation of flies issues from the pupa too late to find host larvae and dies without reproducing. Similar limitations probably affect its attack on *Nygmia phaeorrhoea* Donovan. Whilst first stage larvae of *B. piniariae* always attach themselves to the wall of the host's mid-gut, second instar larvae to the trachea, and whilst third instar larvae form a protective covering of the host's remains, in *B. nigripes* as many of the first as second instar larvae float free in the mid-gut as attach themselves to the tracheal wall, and third instar larvae may or may not form a protective covering of the host's remains. Whereas *B. nigripes* always completes a summer generation, *B. piniariae* rarely does so. In the first instar the apex of the anterior hook of the buccopharyngeal armature is more sharply angled in *B. nigripes* than in *B. piniariae*, but occasionally this difference is indistinct. When 3 or 4 days old, *B. nigripes* almost always—but not invariably—shows progressive sclerotisation of the basal lobes of the buccopharyngeal armature. This is never seen in *B. piniariae*. Other larval stages are inseparable.

Dowden states that the adults are identical in every respect, including the genitalia, but that W. F. Sellers has been able to separate the two forms on the ratio of the frons at its narrowest part to the head width. The following are the ratios that Sellers obtained:

B. nigripes, male: 0·224 to 0·245 mm.; female: 0·293 to 0·308 mm.

B. piniariae, male: 0·274 to 0·286 mm.; female: 0·324 to 0·333 mm.

In consequence of the difference, Dowden states:

"Since the two forms are readily separated and do not show a natural tendency to interbreed, it is believed that they have become sufficiently stabilised to be considered as having a more specific than racial relationship."

However, the following analysis reveals that a large mixed material of the forms cannot readily be separated into two species in the way suggested by Dowden and Sellers. The analysis was made from all imagines available, namely 84 male and 33 female specimens, mainly from the Wainwright collection, but about 10 from the British Collection, of the British Museum (Natural History). In this material there was, of course, no division into the two forms, as unfortunately only four specimens were labelled with the host from which

they had been bred, and it was found that the number of intermediates between Sellers' limits was far greater than the number falling within his groups. The sex of all specimens was checked, although they were already separated in the collections, and each specimen had a number attached to it so that any extraordinary ratios could be checked. Before entering on a detailed analysis of the

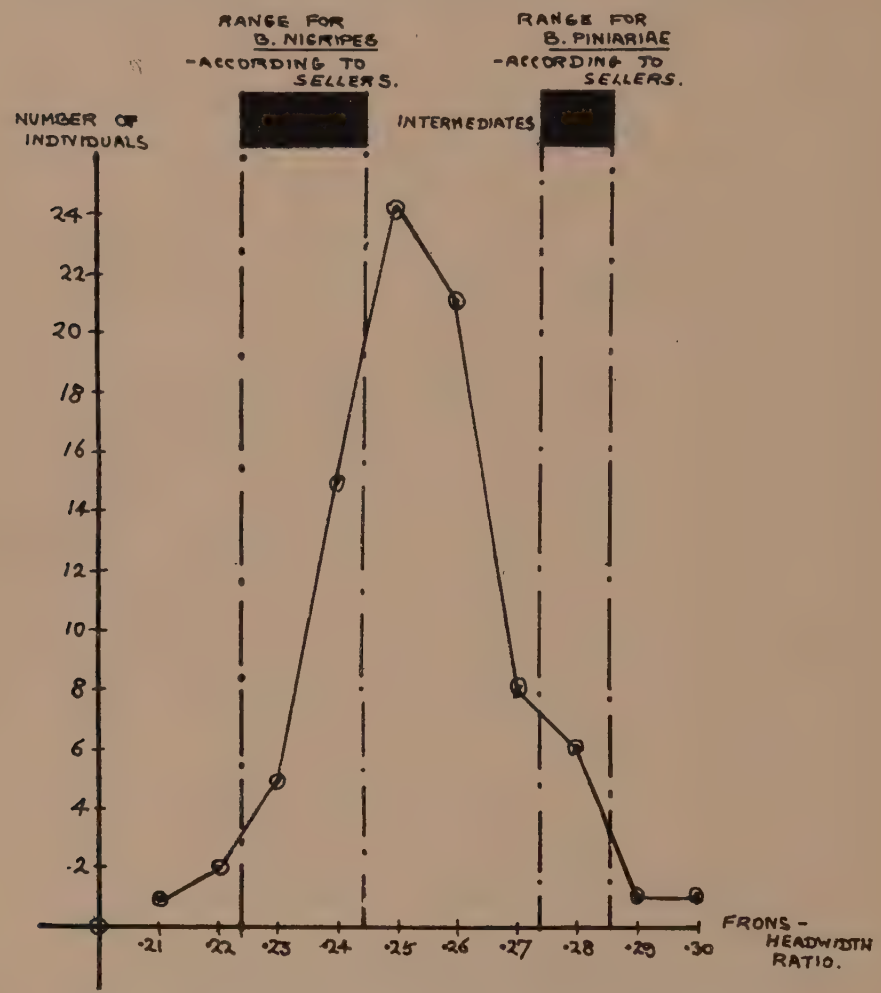


Fig. 1.—Numbers of individuals plotted against frons–headwidth ratio.

results, it is convenient to tabulate Sellers' limits in the following way which will make it easier to refer to them on the basis of the succeeding discussion.

	B. nigripes.	Intermediate values not seen by Sellers and Dowden.	*B. piniariae.*
Males . . .	0·244 to 0·245 .	0·246 to 0·273 .	0·274 to 0·286
Females . .	0·293 to 0·308 .	0·309 to 0·323 .	0·324 to 0·333

Of the 84 males examined, all but 28 were intermediates; and of the 33 females, 10 were intermediates and fell between Sellers' limits. Most of the remaining analysis was done on the males, as their larger numbers tend to lead to more representative results.

(*a*) The males were divided into 10 groups based on the second decimal place of the frons–headwidth ratio, and when the number of individuals in the various groups were plotted against this, an almost perfect normal distribution curve

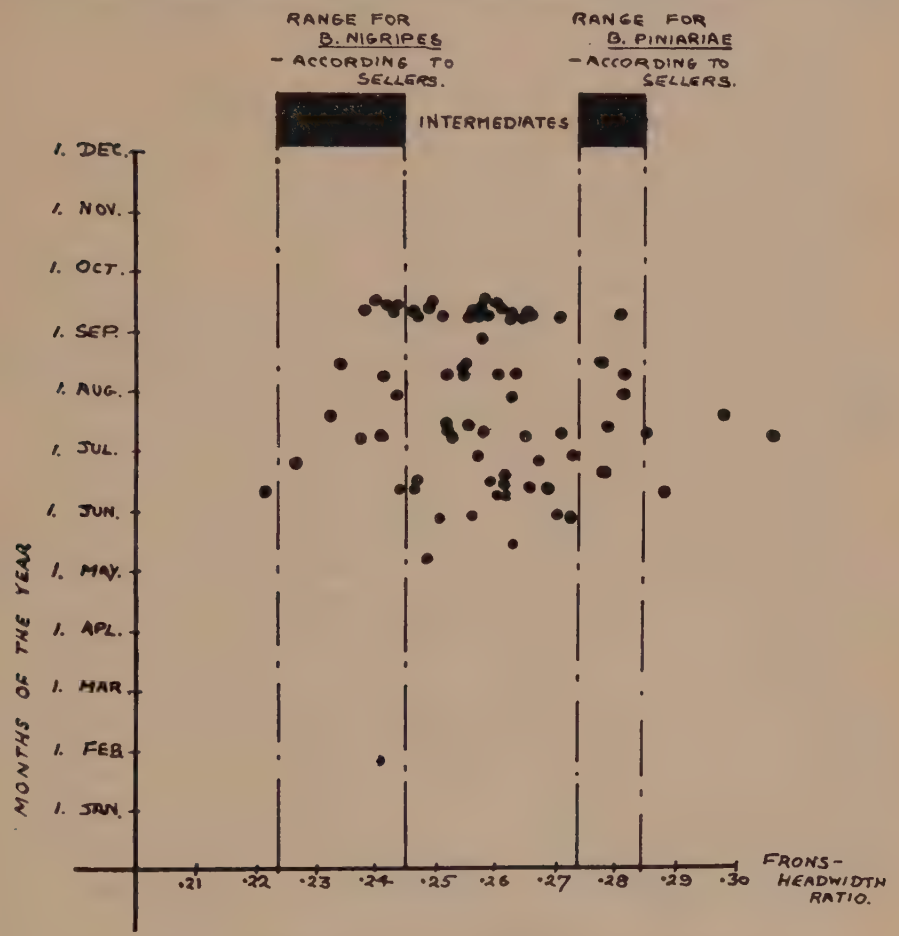


Fig. 2.—Date of capture plotted against frons–headwidth ratio.

resulted (fig. 1). This indicates quite conclusively that the two forms cannot be identified among a larger *mixed collection* by the character suggested in Dowden's paper.

As the author would have liked to make some positive contribution to the question in hand, the reason for variation in frons–headwidth ratio was investigated.

(*b*) The frons–headwidth ratios of the males were therefore plotted against the date of capture, but the graph (fig. 2) failed to demonstrate any seasonal effect

on frons–headwidth ratio and only emphasized the large number of intermediates.

(*c*) The other line investigated was the possible effect of location on the frons–headwidth ratio. Few localities were represented in sufficient numbers to give satisfactory results, but a much repeated locality (Heddon's Mouth) was found to have a fairly constant occurrence in each group of frons–headwidth ratios (which were divided on the second decimal place). The one high percentage is attributed to the fact that the specimens were collected together in the same month of one year.

Percentage.	Frons–headwidth ratio group.
20	·23
50	·24
25	·25
20	·26
12·5	·27

At a later date, a number of additional specimens were made available by Prof. W. Zwölfer of Munich. These were all *B. "piniariae"* bred from *Bupalus piniarius* L. Out of the 13 males and females examined, 7 fell outside Sellers' limits, showing that even a small homogenous collection is liable to contain a fair number of intermediate forms.

Discussion of the Results.

There is thus insufficient evidence for regarding *B. piniariae* and *B. nigripes* as separate species on the characters known to Sellers and Dowden. The adults appear to be morphologically inseparable, while the two very minor differences demonstrated in the larvae are both stated as being variable. However, biological facts seem to show that there are two different strains.

It therefore seems reasonable (until the contrary is demonstrated) to assume that the two types show an early stage of evolution in the biological separation of two distinct species of the future—at present there being only a hint of morphological differences, especially in the immature stages.

Until more is known, especially about the genetical relationships of the two forms, they should only be regarded as two biological races of the same species, the name *Blondelia nigripes* Fallén having priority.

Acknowledgments.

I am grateful to Professor O. W. Richards for reading the manuscript and for helpful criticism, and to my father, Dr. F. I. van Emden, for suggesting the subject.

Reference.

Dowden, P. B., 1933, *Lydella nigripes* and *L. piniariae*, fly parasites of certain tree-defoliating caterpillars. *J. agric. Res.* **46** : 963–995.

NOTES ON DERMAPTERA.

By W. D. Hincks, D.Sc., F.R.E.S.

(*Manchester Museum.*)

I. Two Additions to the Fauna of the Seychelles.

Burr (1910, *Trans. Linn. Soc. Lond., Zool.* (2) **14** : 123–133) was the last author to write on the Dermaptera of the Seychelles and his report on the collections made by Dr. Hugh Scott and other members of the Percy Sladen Trust Expedition of 1905 included 12 species, of which 3 were previously undescribed. The latter were presumed to be endemic species but one of them, *Sparatta* (now *Chaetospania*) *gardineri* has since been recorded from Borneo by Borelli (1932, *J.F.M.S. Mus.* **17** : 187).

Dr. W. J. Hall, Director of the Commonwealth Institute of Entomology, has been kind enough to allow me to examine a few specimens collected by Mr. E. S. Brown during his recent tour of duty to the islands of the Seychelles group. The species collected include the cosmopolitan *Labia curvicauda* (Motschulsky) and a nymph probably belonging to *Euborellia plebeja* (Dohrn). On the boat from Mombasa to the Seychelles Mr. Brown took two nymphs which are probably the cosmopolitan *Euborellia annulipes* (Lucas).

In addition this small collection contains two species which are previously unrecorded from the islands, one being new to science.

Gonolabis electra Burr.

Gonolabis electra Burr, 1910, *Fn. Brit. India*, Dermaptera : 79, pl. 3, f. 21, 21*a*. (♂♀, Ceylon, Java).

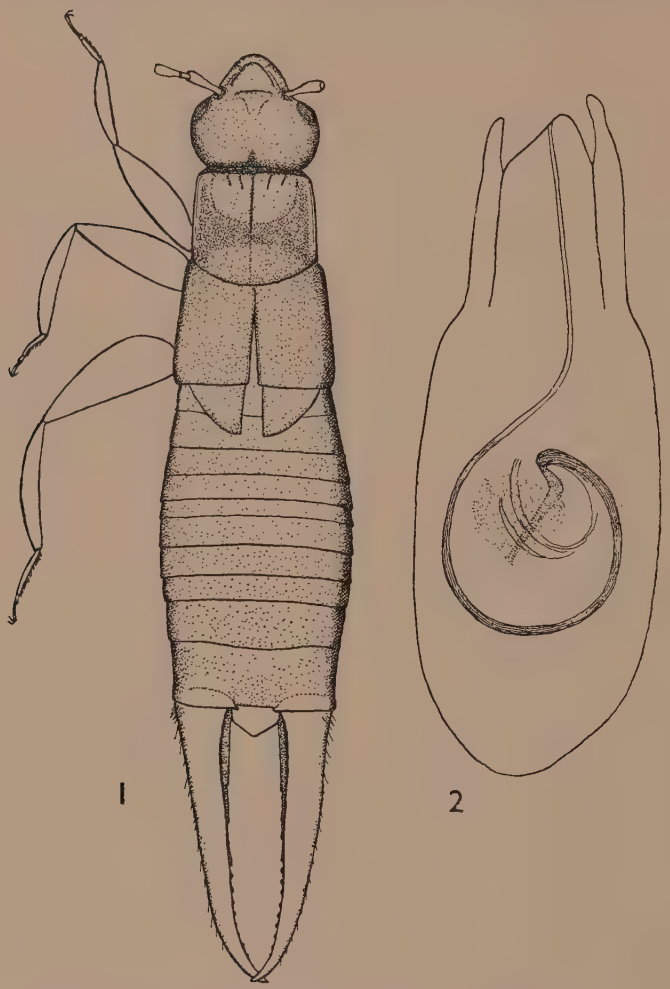
Seychelles : Mahé, Union Vale, vii.1952, in rotted coconut crown, 1 ♀; 4.x.1952, in soil round coconut tree, 1 ♀, 1 nymph. Praslin, Grande Anse, 27.iii.1952, from rot in coconut trunk, 2 ♂, 1 nymph.

These specimens agree well with Burr's type of *G. electra*. Since the original description of the species from Ceylon and Java, however, Burr and others have added records from Sumatra, Cochin China, Philippines and Singapore. I believe that Burr's series now in the British Museum (Nat. Hist.) represents more than one species, so that it is impossible at present to be certain of the distribution of this species.

Labia browni sp. n. (figs. 1, 2).

Male.—Colour brown, legs and mouthparts lighter. *Head* slightly broader than long, convex above ; sutures absent ; eyes small, shorter than first antennal segment. Antennae 15 (+?) segmented ; distal segments tending to be subpyriform. *Pronotum* slightly broader than long, slightly narrower than head ; sides straight, slightly converging cephalad; caudal margin convex ; surface micro-sculptured and pubescent ; prozona slightly tumid with well-defined median longitudinal sulcus, on each side of which are two short impressed lines. *Tegmina* short, little longer than pronotum, sculptured and pubescent ; caudal margin almost transversely truncate. *Wing-scales* of moderate length and similarly

clothed to tegmina. *Abdomen* expanded to about seventh tergite, thence contracted to ultimate tergite; sculptured and pubescent but more finely than tegmina. Ultimate tergite transverse; caudal margin, above pygidium, shallowly sinuate; sinuation bounded by a triangular tooth on each side. *Pygidium* short, pentagonal, pointed caudad. *Forceps* relatively long, deflexed; trigonal basad, flattened above and on inner face, becoming subcylindrical and slightly curved distad; inner lower margin coarsely crenulate distad.



FIGS. 1–2.—(1) *Labia browni* sp. n., male; (2) male genitalia.

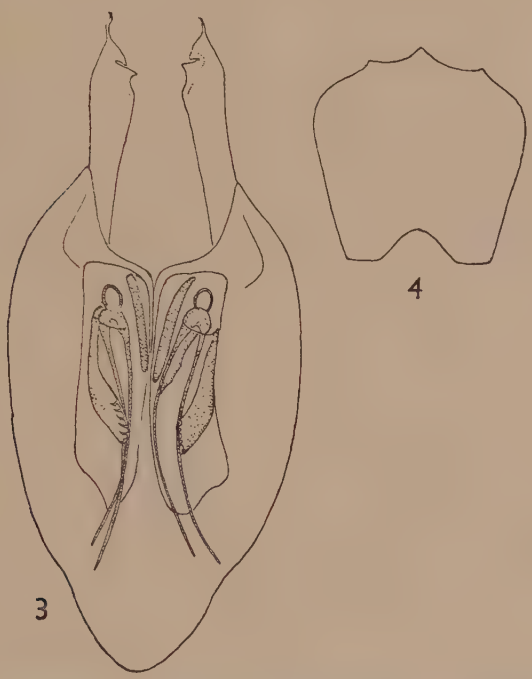
Penultimate sternite transverse, simple; caudal margin almost truncate. *Legs* short and stout, particularly femora. *Genitalia* (fig. 2). Parameres slightly asymmetrical, one being longer than the other; virga long and stout, strongly curved in proximal half; base of virga deflected downwards into centre of basal portion of median lobe and therefore difficult to trace.

Length 7·5 to 8 mm.

Female very similar to male; ultimate tergite simple; pygidium hidden; forceps more abruptly tapering and less crenulate. Length 5 mm. (badly shrunken specimen).

Types: Holotype ♂, allotype ♀, paratype ♂ and a nymph. SEYCHELLES: Praslin, Grande Anse, 26.v.1952, tree 63 in old *Melitomma* tunnels (*E.S. Brown*) (British Museum (Natural History)). Above paratype male in the Hincks collection.

This species is slightly larger and broader than *Labia minor* (L.) and is easily distinguished from *L. fryeri* Burr, 1910, from the Seychelles (Silhouette) by the two marginal teeth on the ultimate tergite and by the form of the pygidium. The same characters, together with the form of the genital armature, will distinguish the species from all the other members of the genus which I have examined.



FIGS. 3–4.—(3) *Diplatys excidens* sp. n., male genitalia; (4) penultimate sternite.

II. A NEW *Diplatys* SERVILLE (PYGIDICRANIDAE) FROM SOUTH INDIA.

A second small consignment of Dermaptera recently sent for identification by Dr. W. J. Hall included a single male example of an interesting undescribed species of the genus *Diplatys*. The writer's revision of the Diplatyinae is in the press and it is now too late to include this species in its appropriate place.

Diplatys excidens sp. n. (figs. 3, 4).

Male.—Colour piceous; cephalic, caudal and lateral margins of pronotum, proximal antennal segments, except first, base and apex of femora and tibiae, proximal tarsal segments and base of forceps, subtestaceous. Surface of foreparts dull, micro-reticulate. *Head*: Eyes longer than genae; frons passing gradually into depressed occiput; frontal

sutures obsolete; coronal suture present; occiput not rugose; post-ocular carinae moderately distinct, curved, evanescent caudad. Antennae broken, 13 segments remaining, normal. *Pronotum* longer than broad; sides straight, converging caudad; caudal margin convex. *Tegmina* and *wings* fully developed, normal. *Abdomen* cylindrical, slightly expanded to eighth tergite, more shining than foreparts, moderately strongly punctured with sparse but distinct pubescence. Ultimate tergite normal, subquadrate; caudal margin slightly concave mesad. *Forceps* contiguous, straight, tapering; inner margins crenulate; upper surface basad with well-marked raised flange. *Legs* normal for the genus. *Penultimate* sternite (fig. 4) with disc convex, slightly depressed near caudal margin which is deeply emarginate mesad; sides oblique. *Genitalia* (fig. 3). Parameres with two inner teeth placed close together; virga relatively long and slender; median lobes containing accessory rod and boomerang-shaped plate terminating in a row of large teeth. *Length* 11 mm.

Type ♂, S. India: Mysore, xi.1953, at light (*S. Usman*) (British Museum (Natural History)).

This species belongs to the *greeni* group (Hincks, *in press*) and keys out to the South Indian *D. lefroyi* Burr, from which it differs in the more elongate pronotum, more strongly emarginate penultimate sternite and in the genitalia. It resembles closely in external appearance *D. nilgiriensis* Hincks, from South India, but differs also in the slightly more elongate pronotum, in the markedly more strongly emarginate penultimate sternite and in the genitalia.

III. A Note on the Genera *Marava* Burr, 1911, and *Prolabia* Burr, 1911.

In 1927 Hebard (*Proc. Acad. nat. Sci. Philad.* **79** : 30) wrote as follows: "We find that *Marava*, described in 1911, with genotype *grandis* (Dubrony) is so close to *Prolabia*, described in 1911, with genotype *arachidis* (Yersin), that we are obliged to transfer it from the Spongiphorinae to the Labiinae. From *Prolabia* it is best distinguished by the large eyes which are as long as the cheeks, the decidedly longer second joint of the caudal tarsi which is twice as long as wide and the head which, though full, shows a trace of Spongiphorine contour particularly in the feeble impression of the occiput."

I have found these two genera very difficult to distinguish but not having male specimens available of *Marava wallacei* (Dohrn) (= *grandis* Dubrony) I had put the matter aside until recently, when Dr. Ragge was kind enough to give me two duplicate males from Java. Quite recently however, Dr. Boeseman (1954, *Zool. Verh.*, Leiden, no. **21** : 83) has reported on a large and variable series drawing the conclusion that *M. wallacei* is a synonym of *P. arachidis*. Boeseman discusses the variation and I find that my own much smaller series of the two so-called species agree with his views. In addition I have compared the genital armature of typical macropterous, contrastingly coloured *wallacei* from Java with uniformly coloured, micropterous material imported into Britain, and find them identical. I cannot appreciate Hebard's point regarding the caudal tarsi as all my specimens appear to have the second joint identical and about twice as long as broad. As Boeseman points out, the size of the eyes as compared to the genae appears to be somewhat variable. I therefore find myself in agreement with Boeseman's synonymy but since *Marava* has page priority over *Prolabia* the genus must take the former name. The well-known cosmopolitan earwig which is often imported into Britain must therefore be

known as *Marava arachidis* (Yersin). The synonymy involved may be summarised as follows:

Marava Burr, 1911.

Marava Burr, 1911, *Dtsch. ent. Nat. Bibl.* **2** : 59, 60 (type *Labia grandis* Dubrony).
Prolabia Burr, 1911, *loc. cit.*: 60 (type *Forficula arachidis* Yersin) (**syn. nov.**).
Andex Burr, 1911, *loc. cit.*: 60 (type *Labia nigroflavida* Rehn).

All three genonyms are isogenotypic by synonymy.

Marava arachidis (Yersin).

Forficula arachidis Yersin, 1860, *Ann. Soc. ent. Fr.* (3) **8** : 509, pl. 10, f. 30–35 (France, introduced).
Forficula nigripennis Motschulsky, 1863, *Bull. Soc. Nat. Moscou* **36** : 1.
Labia wallacei Dohrn, 1864, *Stettin. ent. Ztg.* **25** : 427.
Apterygida gravidula Gerstaecker, 1869, *Arch. Naturgesch.* **35** : 221.
Labia grandis Dubrony, 1879, *Ann. Mus. Stor. nat. Genova* **14** : 366.
Labia nigroflavida Rehn, 1905, *Proc. U.S. nat. Mus.* **29** : 507, f. 5.

About 20 species have been described as belonging to *Marava* or *Prolabia*, but I have been able to examine only a few of them up to the present. The published descriptions of several species however suggest that they may require to be transferred to other genera of the Labiidae.

Book Notice.

African insect life. By S. H. Skaife. Large 8vo. London & Cape Town (Longmans Green & Co.), 1954. Pp. viii + 387, pls., text illust. Price 63*s*.

This book is mainly intended for entomological teachers and students, but the easy, though not "popular" style in which it is written will certainly commend it to a much wider public, including all amateur students of natural history.

Each of the twenty-two chapters is devoted to a group of insects and includes at the end a brief classification of the families comprising the group.

The very full illustrations are the author's own work. They include five coloured and seventy half-tone plates, and many line drawings, all of a very high standard.

A combined scientific and general index completes the work.

NOTES ON THE ETHIOPIAN PENTATOMOIDEA (HEMIPTERA): XX: ON *STEGANOCERUS* MAYR (SCUTELLERIDAE) AND THE STRUCTURE OF THE AEDEAGUS.

By Dennis Leston, F.R.E.S.

Leston (1952) has described the male genitalia of *Steganocerus multipunctatus* Thunberg, basing his description on material from Angola. Further work shows that Angolan specimens differ in genitalic characters from males of Cape Province, Natal and Transvaal, whilst *S. transvalicus* Breddin differs from both Angolan and South African forms of *S. multipunctatus*.

Steganocerus multipunctatus multipunctatus (Thunberg).

The male genitalia have a hook-like paramere (fig. 3). The aedeagus (fig. 1) has a densely sclerotic theca into which the large vesica and conjunctival appendages can obviously never be retracted. The vesica has a large angled dorsal hump and projects forwards for a distance equal to the length of the theca. Above it is a large movable median structure, the supra-vesical appendage: this is laminate but with a bifid apex and its ventral edge angled through 80°. The first and second conjunctival appendages are approximate at base (a Scutellerid character), with the first long, tubular and membranous and terminating in a strong, slightly curved and sclerotic point. The second are laminate and bent vertically through 90°; the dorsal edge is slightly curved. The third conjunctival appendages are tusk-like and slightly curved.

This account is based on males from Ladysmith, Natal.

Steganocerus multipunctatus machadoi subsp. n.

The male genitalia (Leston, 1952) differ from those above described.

The vesica has a slight dorsal hump; the supra-vesical appendage is much longer with the apical bifurcation more apparent and the ventral edge not suddenly angled through 80° but irregularly crenulate throughout. The first conjunctival appendages terminate in a strongly curved point; the second are bent through 90° but the dorsal edge is acutely incised. The third conjunctival appendages are much less robust than in subsp. *multipunctatus* and have a recurved tip. The parameres are feebly hooked.

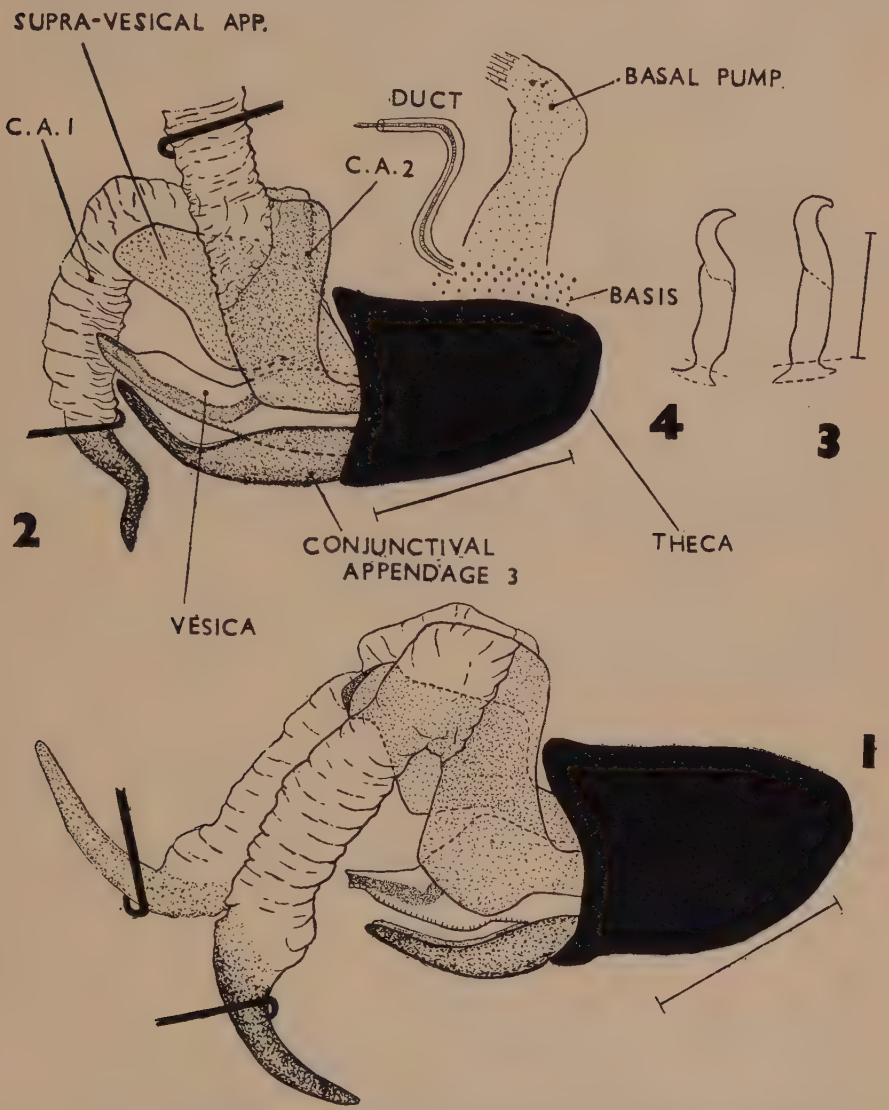
Type, male, Angola: Dundo. In author's collection.

Steganocerus transvalicus Breddin.

The theca (fig. 2) is shorter than the visible part of the vesica; the latter is swollen dorsally but not angularly so. The supra-vesical appendage is simple apically and its ventral edge rounded distally. The first conjunctival appendages terminate in a strongly bent point; the second are bent through 30° and with an almost straight dorsal edge. The third conjunctival appendages have long and upwardly bent apices. A paramere is figured (fig. 4).

This account is based on a male from Rustenburg, Transvaal.

Kirkaldy (1909) cited "Continental Ethiopian region" as the range of *Steganocerus multipunctatus*. Breddin (1908) described a second species, *S. transvalicus*, with type locality as "Transvaal". Subsequently, Schouteden



FIGS. 1–4.—(1) Aedeagus, lateral (basal apparatus omitted), of *Steganocerus multipunctatus multipunctatus* (Thunberg). (2) Aedeagus, lateral (basal apparatus, indicated diagrammatically), of *S. transvalicus* Breddin. (3) Right paramere of *S. multipunctatus multipunctatus*. (4) Right paramere of *S. transvalicus*. All scales = 0·5 m.m.

(1909) stated that he had seen examples of *S. transvalicus* from Natal and Transvaal and later (1912) gave the Zoutpansberg as the Transvaal locality: it is impossible to tell from the context if Schouteden refers to the political division

or to the mountain range south of the Southern Rhodesia border. A male and a female of *S. transvalicus* have been received taken at Rustenburg, Western Transvaal, November, 1948, and February, 1949 : they are the first to have adequate locality data. As *S. multipunctatus* occurs commonly throughout Transvaal and *S. transvalicus* resembles a common colour variety of it, doubt was felt as to the valid specificity of *S. transvalicus*. However, examination shows that it is distinctive and, being sympatric with *S. multipunctatus*, entitled to specific rank.

The two species can be separated thus :

Rostrum reaching to or beyond the posterior coxae ; supra-vesical appendage apically bifid ; first conjunctival appendages almost straight or gradually curved . . . . . *multipunctatus* Thunberg

Rostrum reaching to the middle coxae ; supra-vesical appendage apically not bifid ; first conjunctival appendages distinctly bent . . . *transvalicus* Breddin

The type locality of *S. multipunctatus* is the Cape Town area, but specimens from there show such slight differences from the Ladysmith example that for the moment they are considered to be consubspecific.

All attempts to trace Breddin's type of *S. transvalicus* have failed : from the description it appears to resemble the typical variety of *S. multipunctatus*. The Rustenburg examples correspond to var. *impluviata* Germar of the latter species, so that it is clear the two species exhibit parallel variation.

Acknowledgments.

Dr. A. de Barros Machado, Mr. A. L. Capener and Dr. A. H. Newton are thanked for kindly submitting, amongst many other specimens, the material upon which this paper is based.

Summary.

Steganocerus transvalicus Breddin is shown to be a good but restricted species sympatric with the widespread *S. multipunctatus* (Thunberg) : the male genitalia of both are figured and described. *S. multipunctatus* breaks down into subspecies of which the male genitalia of one, *S. multipunctatus machadoi* subsp. n. from Angola, has been figured elsewhere. The species exhibit parallel variation.

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NOTES ON ETHIOPIAN *URANOTAENIA* (DIPTERA: CULICIDAE) WITH A DESCRIPTION OF A NEW SPECIES.

By P. F. Mattingly, F.R.E.S.

(*British Museum, Natural History*).

Uranotaenia cavernicola sp.n.

The following description is based on two adults, the holotype male and allotype female, in the British Museum, kindly sent me by Dr. Fain of the Belgian Congo medical service and collected by him in the Yolohafiri Cave on Mt. Hoye, south-west of Irumu, and two whole larvae, from the same cave, kindly sent me by M. Leleup of the Institut pour la Recherche Scientifique en Afrique Centrale, which are almost certainly of the same species.

Adult ♂.—*Head*: Proboscis dark, somewhat swollen at tip, about equal in length to the front femur. Palps dark, minute. Vertex covered with broad scales which are dark in the centre, pale brownish at the sides and back and round the eye margins. A few narrow brown upright forked scales also present posteriorly. *Thorax*: Anterior pronotum pale, clothed with numerous broad, creamy scales. Posterior pronotum dark chocolate brown above and with a few broad, flat, dark scales, paler and bare below. Scutum chocolate brown, slightly darkened above the wing roots, covered with narrow, dark,

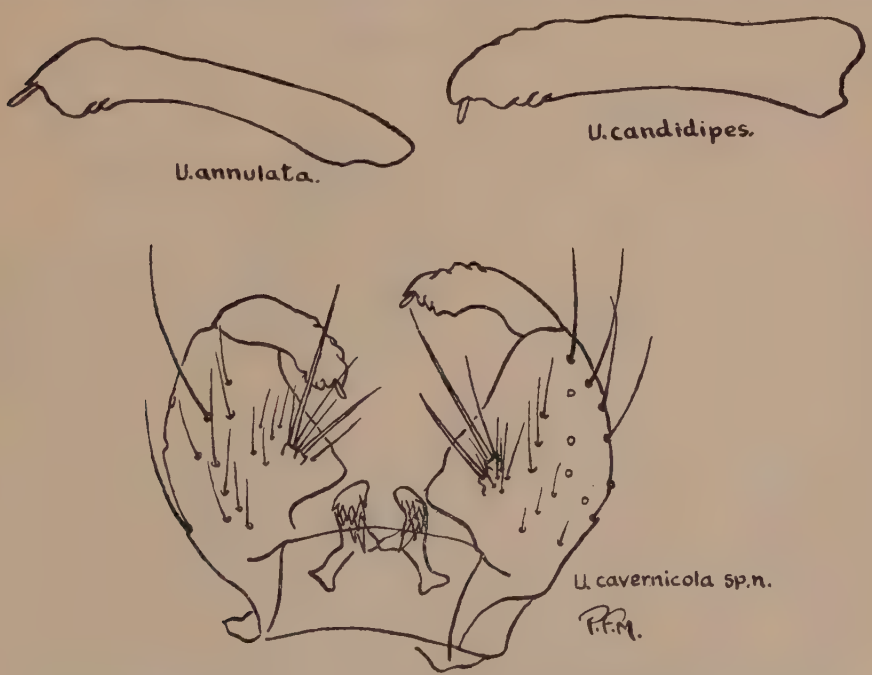

Fig. 1.—*Uranotaenia cavernicola* sp. n. Male terminalia. The styles of *U. annulata* and *U. candidipes* are shown for comparison.

curved scales and with a band of narrow creamy scales in front of the wing roots. Acrostichal bristles present. Scutellum rubbed, scales apparently all broad and dark. Pleurae pale yellow except for a conspicuous dark chocolate stripe which runs back from the upper part of the posterior pronotum across the base of the neck of the sternopleura and the upper part of the mesepimeron. Sternopleura with a patch of broad, flat, creamy scales immediately below the dark stripe. Pleurae otherwise bare. Postnotum a more or less uniform dark brown. Wings and knobs of halteres entirely dark. Stems of halteres pale. Legs entirely dark. Tarsi without special modification. *Abdomen*: Tergite I dark. The following tergites with pale basal spots or bands which become broader on posterior segments but in no case reach the edges of the tergite. Venter pale except that sternites V and VI have narrow dark basal bands (faintly indicated also on IV) and sternite VII is entirely dark. *Terminalia* (fig. 1): VIIIth tergite with a small basal pale spot.

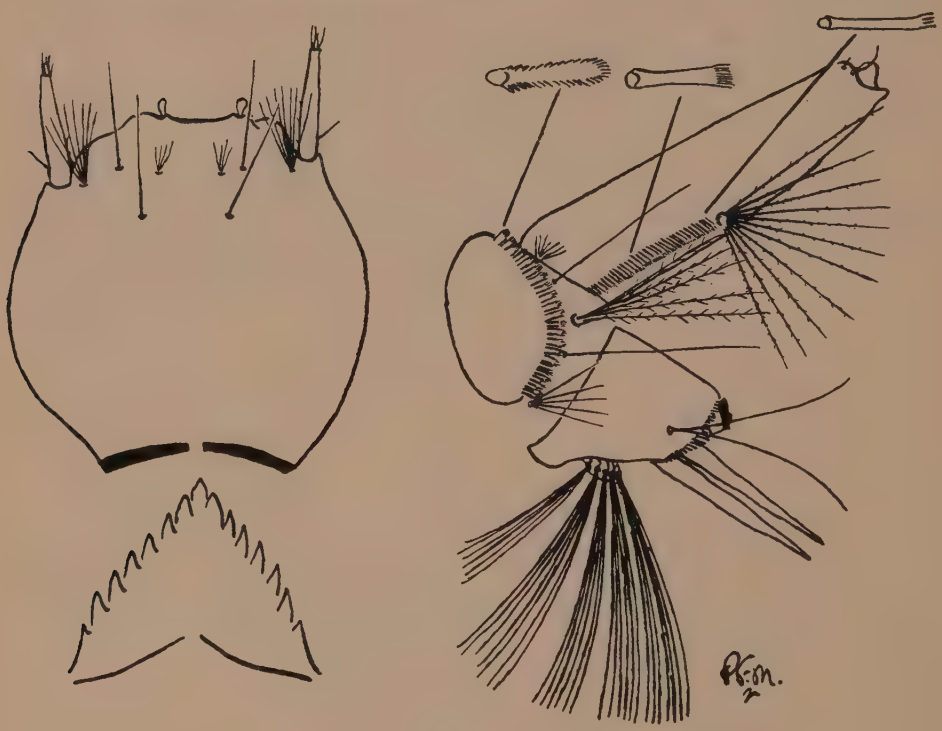

Fig. 2.—*Uranotaenia cavernicola* sp. n. Fourth stage larva.

Style rather short and broad, its terminal appendage small and inconspicuous. Basal lobe of coxite poorly developed with two stout spines, one of which is very much shorter than the other, and a number of delicate bristles. Phallosome with numerous small backwardly directed teeth. IXth tergite very shallow, slightly convex, without projections at the corners. There terminalia are very like those of *U. annulata* Theobald and *U. candidipes* Edwards. The style of the former is perhaps slightly narrower than in the other two but it must be emphasised that such differences are peculiarly liable to exaggeration in *Uranotaenia* owing to the great change in apparent shape which accompanies even slight rotation.

Adult ♀.—Very much as in the male except that the apices of the hind femur and tibia have narrow, not very conspicuous, pale spots and the abdominal tergites are entirely dark.

Pupa: Unknown. *Larva*: As noted above, the attribution to *U. cavernicola* is provisional but from the provenance of the larvae and their close general agreement with those of *U. annulata* and *U. candidipes* it would seem that it is almost certainly correct. *Head*: Very dark, contrasting strongly with the pale thorax and abdomen. Antenna dark, very lightly spiculate on the inner face. Antennal seta arising near the base, as in *U. annulata* and *U. candidipes*, single or, on one side in one larva, bifid. Clypeal spines as in *U. annulata* and *U. candidipes*, short, broad, transparent spatulate. Head seta A with about 4–7 moderately stout branches. B and C moderately stout, unbranched, serrated bristles, *d* very delicate with about 4 branches. Mentum with 7 teeth on either side of the main central tooth. *Abdomen*: Comb of 19–25 long, narrow scales, fringed all round, set on a large and conspicuous comb plate. One or two of the outer scales with coarse basal denticles. Siphon dark, index about 2·75 in crushed or 4·0 in uncrushed specimens.

Fig. 3.—*Uranotaenia neireti* Edwards. Male terminalia.

Pecten of 21–26 long, narrow scales fringed only at the apex, the distal scales narrower and with fewer and rather stouter teeth in the fringe. Siphonal tuft of about 12 long, rather stout branches. Saddle strongly sclerotised, complete, its distal edge strongly spiculate. Saddle hair long, bifid. Caudal setae missing. Ventral brush with 5 pairs of strongly branched setae set in a very strongly sclerotised barred area. Anal papillae long, narrow, pointed, subequal, about half as long again as the saddle.

Breeding place.—Not stated except that it was inside the cave, an interesting fact prompting comparison with *U. annulata* and *U. candidipes*, which breed in crab-holes.

That this species should be placed with *U. annulata* and *U. candidipes* in Group B of Edwards (1941) seems unquestionable in view of the close resemblance in their very striking thoracic markings and in larval and genitalic characters. It differs markedly from both species, however, in the ornamentation of the abdomen and in the dark hind tarsi. It appears most closely to resemble *U. candidipes* which occurs further south in the highlands of eastern Africa from the Kivu region to the Transvaal.

Uranotaenia neireti Edwards.

The male terminalia of this species have not previously been described. Through the kindness of M. Séguy the British Museum has received two males from Antsirabe, Madagascar (coll. Seyrig), in exchange from the Paris Museum. A description of the terminalia of one of these follows (fig. 3).

Style of moderate length, relatively slender, tapering. Distal appendage small and inconspicuous, sub-terminal, accompanied by about half a dozen microsetae. Basal lobe

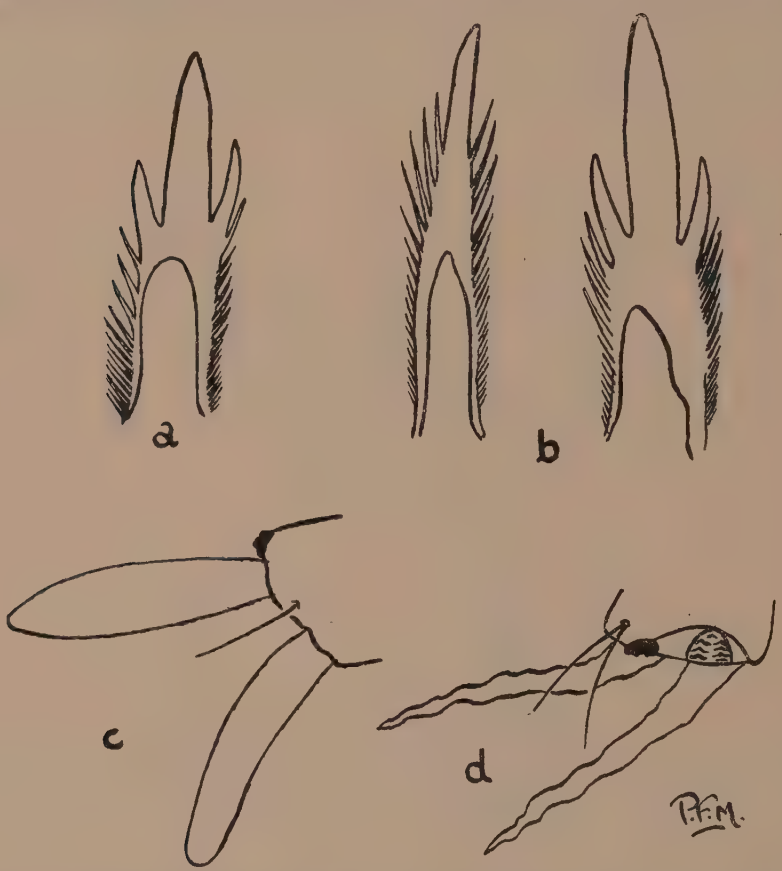

Fig. 4.—*Uranotaenia fusca :* (*a*) Comb spine of specimen from Etoudi ; (*b*) comb spines of specimens from Evodoula ; (*c*) anal papillae of specimen from Kericho ; (*d*) anal papillae of specimen from Jos.

of coxite poorly developed with three stiff bristles of different thicknesses, the thickest markedly longer than the other two. Lateral plates of phallosome with recurved teeth large and few in number. IXth tergite shallow, slightly convex, without projection in centre or at corners.

It will be seen that these terminalia justify the inclusion of *U. neireti* in his Group B by Edwards (1941). It clearly belongs, however, to a distinct super-species from *U. cavernicola*. The larva of *U. neireti* is still unknown. It may

well be one of a number with unknown adults recently described under various names from Madagascar (*U. dumonti* Doucet, 1949, *U. lavieri, tsaratananae, andavakae, combesi* Doucet, 1950, *U. grenieri, brumpti* Doucet, 1951, but not *U. pauliani* Doucet, 1949, which is a synonym of *U. pandani* Theobald (Mattingly *in press*).)

Uranotaenia fusca Theobald.

An unassociated larva from Etoudi near Yaoundé, French Cameroons, sent me by Monsieur Rageau resembles the larva of this species in most respects but has comb spines with unusually strongly developed secondary denticles (fig. 4*a*). From the resemblance of these spines to those of *Uranotaenia shillitonis* and a general similarity in the arrangement of the head setae I suggested that this might be the unknown larva of *U. henrardi* Edwards which is related to *U. shillitonis* and is known to occur in the Léopoldville area (*Vide* Rageau and Adam, 1952). I have now examined further larvae from Evodoula in the French Cameroons and from the range of variation which they exhibit it is clear that the Etoudi larva is in fact an atypical *U. fusca* (fig. 4*b*). Larvae of the *U. shillitonis* group (Group D of Edwards 1941) are normally recognisable by the absence of a comb plate but it is not certain that this will necessarily prove to be true of the larva of *U. henrardi*. Doucet (1951) has described and figured larvae from bamboos, provisionally attributed by him to *U. shillitonis*, in which a small comb plate is present. It is not certain that these are in fact larvae of *U. shillitonis* but it seems probable that they belong to the same group. Other atypical larval skins of *U. fusca*, with associated adults, from Kericho, Kenya have been sent me by Mrs. Van Someren. These differ from typical *U. fusca* larvae in the shape of the anal papillae but otherwise seem normal (fig. 4*c*, *d*). The anal papillae shown as typical (fig. 4*d*) are those of a larva from Jos, Nigeria, sent by Dr. Bruce-Chwatt. This record is of interest as being perhaps the first of a Culicine mosquito from the higher parts of the Bauchi Plateau.

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CHIRONOMIDAE (DIPTERA) FROM WESTERN CAPE PROVINCE—IV.

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Parts I–III of this series were published in Volumes 22–23 of these *Proceedings*. Reference to Part I (**22**: 127–135) should be made for details of localities, collectors and terms used. This is the last part of the series and deals with new species collected by Dr. K. M. F. Scott since the work was started.

Pentaneura trifascia sp. n.

Thorax with cross-banded appearance as in *P. tricolor* Goetghebuer, but it is easily distinguished by absence of dark rings on legs; wing markings more or less in three cross bands.

Female.—Wing length 2·75 mm.

Head and mouthparts brown, antennae more yellow. *Thorax* reddish brown, pruinose, with a darker transverse central band; hairs pale. *Legs* yellowish, femora darkened subapically. *Wings* (fig. 11*a*) densely covered with pale macrotrichia, dark macrotrichia present as shown to form a pattern more or less as three transverse bands, extreme apex pale; halteres white. *Abdomen* brown, apices of segments pale.

Holotype female and 1 ♀ paratype, Tulbagh Barrage, 17.xi.53.

Pentaneura octomaculata sp. n.

A small brown species with eight well marked spots of dark macrotrichia on each wing; legs plain.

Female.—Wing length 2·0 mm.

Head yellowish brown, mouthparts slightly darker, eyes bare, antennae 12-segmented. *Thorax* pruinose, scutal stripes brown and separate; intervening lines, shoulders and prescutellar area pale, scutellum whitish yellow, postnotum and pleura dark brown. *Legs* uniformly translucent, unmarked, L.R. 0·75. *Wings* pale, densely clothed with brown macrotrichia, with black macrotrichia forming eight distinct spots as follows: one over the r–m cross vein where the membrane is distinctly darkened, two in cell R_5 placed at one-third and two-thirds of its length, two in cell M_1 more or less below the previous two, one over the apex of Cu and two in the anal cell; in addition there are dark hairs along both branches of M and An. Halteres whitish. *Abdomen* dark brown with pale hairs, apical margins of segments translucent.

Holotype female and 4 ♀ paratypes, Bergvliet, 12.ii.53.

Anatopynia unicolor sp. n.

This species does not fall readily into any of the described genera but its characters are not sufficiently well defined for the erection of a new genus. The produced costa and venation generally suggest *Anatopynia*, but the prothorax and general appearance are more like *Pentaneura*, whilst the suppression of the postnotal furrow is a character of the Podonominae. On balance I consider it falls best into *Anatopynia*, which is a genus without described

African species, although there are specimens of two undescribed species in the British Museum.

A small dark insect without any markings, postnotal furrow almost absent, pulvilli absent, costa produced, r–m rather long, hypopygium normal.

Male.—Wing length 2·0 mm.

Head blackish, palpi rather short, eyes bare, dorsal narrow portions present, antennae with well developed plumes, A.R. 1·0. *Thorax* black, pruinose, prothorax somewhat reduced, more like *Pentaneura*, scutellum brown, postnotum with reduced longitudinal fissure just distinguishable under high power. *Legs* brown, unmarked, L.R. 0·75, pulvilli absent, empodium well developed and long. *Wings* unmarked, densely covered with macrotrichia over most of their surface ; costa produced, reaching nearly half way to M, R_{2+3} well developed and forked, r–m long. Halteres yellow. *Abdomen* uniformly dark, hypopygium normal, styles simple, tapered with a single apical spine.

Holotype male, Berg River, Assegaibos Waterfall, 23.xii.52.

Metriocnemus capensis sp. n.

The male is small and blackish, the female yellowish brown ; A.R. about 0·25, L.R. 1·0, costa strongly produced, halteres pale ; readily distinguished from *M. scotti* Freeman and *dewulfi* Goetghebuer by the shortness of the anal point, low A.R. and high L.R.

Male.—Wing length 1·4 mm.

Head mouthparts and antennae blackish, eyes normal without dorsal spur, last antennal segment short so that A.R. is only about 0·25. *Thorax* entirely blackish brown, slightly pruinose. *Legs* brown ; L.R. of front legs practically 1·0, of hind legs 0·6, pulvilli absent, empodium well developed. *Wings* with a brownish tinge, clothed over most of the surface with macrotrichia which are absent only from the anterior part of the basal third ; costa strongly produced reaching half way to M, R_{2+3} ending about midway between R_1 and R_{4+5}, the latter ending above M_{3+4} ; stem vein and squama each with a single hair. Halteres pale. *Abdomen* dark brown, hypopygium (fig. 11*b*) with extremely short anal point (shown black in figure), coxal lobe moderately developed, style with inner expansion and single apical spine.

Female.—Much paler than male, yellowish brown, scutal stripes only vaguely indicated, wing macrotrichia denser.

Holotype male and 6 ♂, 9 ♀, paratypes, Berg River, Assegaibos, 8.v.53 ; 2 ♀ same locality, 30.vii.52 ; 2 ♂, 1 ♀, Berg River, Assegaibos Stream, 14.viii.53.

Cricotopus bergensis nom. nov.

Cricotopus angustus Freeman, 1953, *Proc. R. ent. Soc. Lond.* (B) **22** : 132, *nec* Goetghebuer, 1927, *Ann. Bull. Soc. ent. Belge* **67** : 52.

When Goetghebuer described the Palaearctic species *C. angustus* he gave Verrall as the author because the latter had used it as a MS. name. Goetghebuer gave no indication that the description had not previously been published and the name was omitted from the *Zoological Record* and so from my card catalogue as well.

Orthocladius reductus sp. n.

This species belongs to Edwards' group D (*Dactylocladius* Kieffer). It is separated from other species of the group by the bilobed terminal antennal segment, flattened fifth tarsal segment, and extremely short anal point. As

stated by Edwards, species of this group show some resemblance to species of *Nanocladius* (*Eukiefferiella*).

The antennal ratio and size of wing lobe are both highly variable. This seems to be correlated to some extent with size ; the smaller specimens have a very low A.R. and an obtuse lobe ; in the larger specimens A.R. may be as much as 0·8 and the lobe slightly produced, also the plumes are better developed.

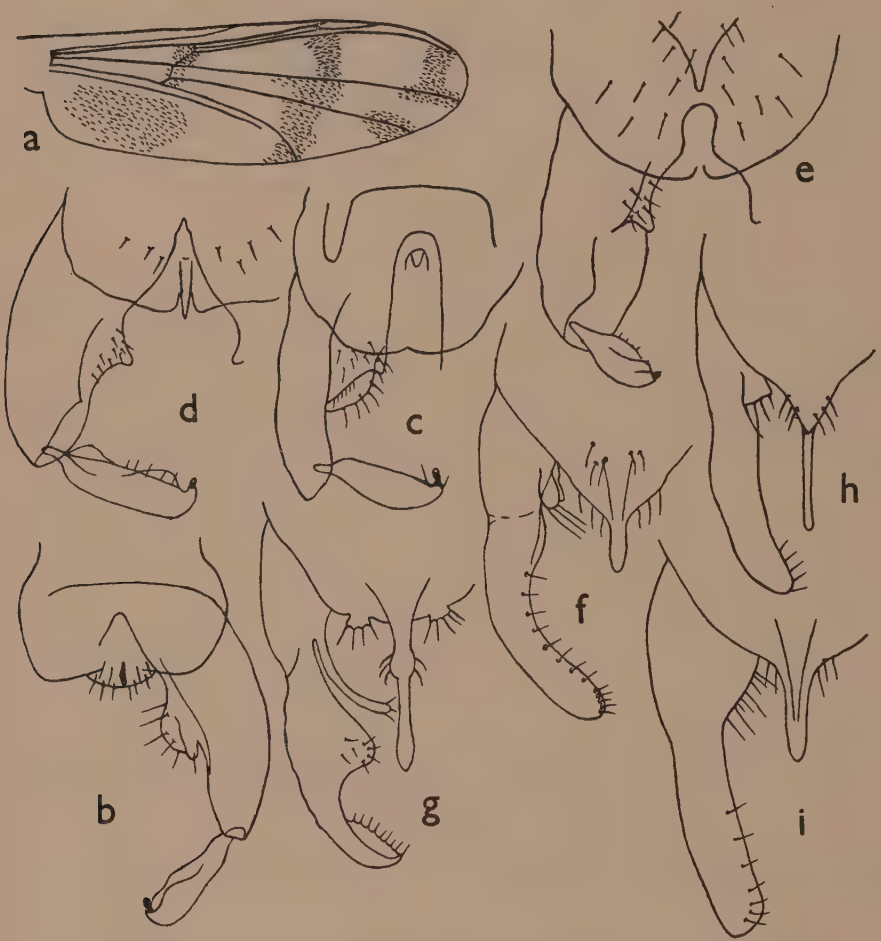


Fig. 11.—(a) Wing of *Pentaneura trifascia*. (b)–(i) Male hypopygia. (b) *Metriocnemus capensis* ; (c) *Orthocladius reductus* ; (d) *Smittia atra* ; (e) *Pseudosmittia conigera* ; (f) *Cryptochironomus ater* ; (g) *C. stilifer* ; (h) *C. reductus* ; (i) *C. atrofasciatus*.

The hypopygium, wing venation, and leg structure are identical in all specimens and intermediate stages of A.R and wing lobe are present in the series examined; I am therefore treating them as belonging to the same species.

Male.—Wing length 1·5–1·6 mm.

Head brownish black, mouthparts and antennae black, A.R. variable from 0·25–0·8,

plumes scanty and not very long, last segment slightly clubbed and with short hairs, bilobed as in *Nanocladius biloba* Freeman (fig. 5*h*). *Thorax* black, slightly shining, stripes more or less fused, shoulders pale, scutellum brown. *Legs* dark brown, L.R. about 0·8, pulvilli present as short rounded pads, empodium long, last tarsal segment flattened. *Wings* tinged with brownish, without distinguishable microtrichia. Costa slightly produced, R_{2+3} close to R_{4+5} for most of its length but ending separately in the costa about two-thirds distance between R_1 and R_{4+5}; posterior fork well distal to r–m, Cu straight, An ending about opposite fork ; lobe obtuse or slightly produced, squamal fringe of 3–5 hairs. Halteres brown. *Abdomen* black, hypopygium (fig. 11*c*) with extremely short anal point, coxa narrow, lobe well developed but not free.

Female.—Similar to male, antennae short. In some specimens stripes separate, ground colour of thorax pale.

Holotype male and 5 ♂, 4 ♀, paratypes Berg River, Assegaibos, 8.v.53 (all males with low A.R.) ; 3 ♂, 3 ♀, Berg River, Driefontein, 14.viii.53 and 1 ♀, 20.viii.53 ; 1 ♂, Berg River, Groot Drakenstein, 26.viii.53 ; 2 ♂, 1 ♀, Berg River, Assegaibos Stream, 14.viii.53.

Nanocladius Kieffer.

Nanocladius Kieffer, 1913, *Voy. Alluaud Jeannel Afr. Or. Ins. Dipt.* **1** : 31.
Eukiefferiella Thienemann, 1926, *Arch. Hydrobiol.* **17** : 325, **syn. nov.**
Microcricotopus Thienemann and Harnisch, 1932, *Zool. Anz.* **99** : 137, **syn. nov.**

This genus was erected to include an East African species *N. vitellinus* Kieffer based on a single female from Kilimanjaro. I have been able to examine this specimen now in the Museum National d'Histoire Naturelle, Paris, and I have found it to be a typical *Microcricotopus*. *Nanocladius* is the earlier name and therefore *Microcricotopus* falls as a synonym and the genus must be known as *Nanocladius* with *Eukiefferiella* as a subgenus.

Nanocladius (Nanocladius) brunneus sp. n.

A small insect distinguished from *N. niveipluma* Freeman by the yellow brown thorax and shorter hairs at apex of antenna, the plumes of which are dark.

Male.—Wing length 1·0 mm.

Head yellowish brown, palpi and antennae dark brown, plumes dark, A.R. about 0·3, apical segment slightly clubbed and with about 10 short, only slightly curved hairs at the apex, not in the form of a rosette ; eyes densely hairy. *Thorax* yellowish with brown stripes, postnotum and sternopleuron dark brown. *Legs* brown, pulvilli present, L.R. 0·6. *Wings* similar to *N. niveipluma*. Halteres yellowish brown. *Abdomen* dark brown, hypopygium essentially similar to *N. niveipluma*, anal point slightly shorter but this may be variable.

Holotype male and 1 ♂ paratype, Berg River, Driefontein, 14.iv.53.

Smittia atra sp. n.

Very similar to *S. nigra* Freeman, distinguished by larger size, pubescent eyes and by the male hypopygium ; anal angle of wing slightly less obtuse, empodium well developed.

Male.—Wing length 1·8 mm.

Head, mouthparts, antennae black ; A.R. about 1·5, eyes clearly pubescent. *Thorax* black, slightly shining and with some pruinosity. *Legs* brown, L.R. 0·6, pulvilli absent, empodium well developed. *Wings* milky, venation very similar to *S. nigra*, anal angle better developed. Halteres dark brown. *Abdomen* blackish brown ; hypopygium (fig. 11*d*)

with bare anal point, IXth tergite with a few hairs, lobe of coxite slightly developed, style with inner flange.

Female.—Wing length 1·4 mm.

Similar to male, distinguished from female of *S. nigra* by pubescent eyes.

Holotype male and 4 ♀ paratypes, Berg River, Cecilia's Drift, 28.iv.53; 1 ♀, Bergvliet, 7.v.53; 1 ♀, Berg River, Wellington, 28.iv.53.

Pseudosmittia conigera sp. n.

Entirely black or dark brown, posterior fork rather wide, Cu slightly bent, An short. Readily distinguished from *P. capicola* Freeman by the long last antennal segment.

Male.—Wing length 1·5 mm.

Head, mouthparts, antennae black, A.R. about 1·6, eyes bare, *Thorax* black, slightly shining and pruinose. *Legs* dark brown, L.R. 0·5; pulvilli absent, empodium well developed. *Wings* milky; costa not produced, R_{2+3} reaching costa near apex of R_{4+5}, which is longer than in *P. capicola* but still slightly short of M_{3+4}; posterior fork fairly short and wide, Cu slightly bent, similar to *P. capicola*, An not reaching the fork; anal lobe well marked and produced. *Halteres* black. *Abdomen* blackish, hypopygium (fig. 11*e*) with widely conical and short anal point, IXth tergite and point with scattered hairs, style rather foreshortened in the figure with slight inner flange.

Holotype male, Berg River, Piquetberg, 27.iii.53; paratypes, 1 ♂, Stellenbosch, 5.ii.53; 1 ♂, Clanwilliam, 6.xii.52; 1 ♂, Platteklip Gorge, 22.i.53.

Chironomus (Cryptochironomus) ater sp. n.

Totally black except for four posterior tibiae and tarsi which are mainly yellowish, hairs pale. Distinguished from *C. leucopus* Kieffer by the black anterior tarsi and the more elongate style.

Male.—Wing length 2·75 mm.

Head, mouthparts and scape black, flagellum brown, plumes black, A.R. about 3·25, frontal tubercles absent. *Thorax* completely black with some pruinosity. *Legs* black except for middle and posterior tibiae and tarsi which are yellowish, darkened at the ends of the segments, though in one specimen the tarsi are mainly black; hairs pale; last tarsal segment on all legs flattened, pulvilli large, anterior tarsi bearded, L.R. 1·25. *Wings* unmarked, anal lobe well formed, posterior fork almost at level of cross vein. Halteres black. *Abdomen* black with white hairs; hypopygium (fig. 11*f*) with reduced appendages and simple styles.

Holotype male, Berg River, Piquetberg, 18.xii.52. Paratypes: same locality, 1 ♂, 27.iii.53; 2 ♂, Sout River Dam, nr. Matroosberg Sta., 7.xii.52; 2 ♂, Tulbagh Barrage, 23.x.53.

Chironomus (Cryptochironomus) stilifer sp. n.

Easily distinguished from related species such as *C. aegyptius* Kieffer by the male hypopygium, otherwise quite similar.

Male.—Wing length 1·5 mm.

Head green, palpi brownish, antennae reddish brown, A.R. 1·5. *Thorax* green, scutal stripes separate and brown, postnotum and sternopleuron brown. *Legs* yellowish green, anterior tarsi and apex of tibiae browner, L.R. 1·6; apical tarsal segment of all legs flattened, pulvilli broad. *Wings* clear, posterior fork distal to cross vein, halteres pale. *Abdomen* green; hypopygium (fig. 11*g*) with long narrow anal point bearing a ventral process with hairs, appearing from above as a swelling near the middle, appendage 1 fairly

long, narrow and curved, appendage 2 absent but there is a short and pad-like appendage near anal point; style long and with a well developed inner process and at the apex with a membranous expansion.

Female.—Resembles male; antenna six-segmented, segments 3–5 without necks, moniliform, sixth equal to 3–5 together.

Holotype male and paratypes 1 ♂, 8 ♀, Berg River, Piquetberg, 28.i.53; 1 ♂, Little Princess Vlei, 28.iv.53.

Chironomus (Cryptochironomus) reductus sp. n.

A small green species with yellowish thoracic stripes, wings without anal lobe, A.R. only about 1, front legs brown, only one coxite appendage present, anal point long. Distinguished from species such as *C. graminicolor* Kieffer by the pale thoracic stripes and long anal point.

Male.—Wing length 1·25 mm.

Head greenish, mouthparts and antennae yellowish brown, A.R. only about 1·0. *Thorax* green, scutal stripes separate, brown, postnotum blacker, sternopleuron brown. *Legs* brown, front legs darker than others, L.R. 2·2. *Wings* with a slight brownish tinge, posterior fork well distal to cross vein, anal lobe quite absent; halteres green. *Abdomen* green, hypopygium (fig. 11*h*) with long anal point, one coxite appendage developed, styles and coxites fused.

Female.—Very similar to male but thoracic markings darker, last antennal segment dark, equal to 4–5 together.

Holotype male, Berg River, Piquetberg, 30.iv.53. Paratypes: 2 ♂, Berg River, Piquetberg, 27.iii.53; 1 ♂, Berg River, Wellington, 11.ii.53, 1 ♀, 17.xii.53; 1 ♀, Berg River, Cecilia's Drift, 17.xii.53.

Chironomus (Cryptochironomus) atrofasciatus sp. n.

Green with black thoracic markings and anterior tibiae and tarsi; hypopygium lacking coxite appendages; separated from similar species such as *C. nudiforceps* Kieffer by the black markings.

Male.—Wing length 2·0 mm.

Head dark brown, frons green, mouthparts and scape black, flagellum brown, plumes whitish, A.R. about 3·0. *Thorax* green, pruinose; scutal stripes, which are separate, postnotum, sternopleuron and a spot below the wing, black. *Legs* green, anterior tibiae and tarsi entirely blackish, no tarsal beard, L.R. 1·6. *Wings* normal, anal lobe prominent, halteres green. *Abdomen* uniformly green, hypopygium (fig. 11*i*) completely lacking coxite appendages, styles rather blunt ended, fused to coxites.

Holotype male, Berg River, Piquetberg, 27.iii.53.

Polypedilum fuscum sp. n.

A medium-sized dark species with pruinose markings on thorax; wings without distinct markings, tibiae and tarsi yellowish, hypopygium very similar to that of *P. scotti* Freeman.

Male.—Wing length 2·5 mm.

Head, mouthparts and antennae dark brown, A.R. about 1·0. *Thorax* dark brown with pruinosity which changes with the direction of the light, acrostichal and dorso-central bristles long. *Legs* mainly yellowish with darker hairs, femora rather browner; anterior tibia with pointed "scale," L.R. 1·8, no tarsal beard. *Wings* without distinct spots but veins seamed with grey and there is a longitudinal grey shadow just discernible in cell R_5, posterior fork well distal to cross vein. Halteres with black knobs and yellow stems.

Abdomen very dark brown; hypopygium extremely similar to *P. scotti* Freeman but styles rather narrower and more parallel-sided.

Holotype male and 2 ♂ paratypes, Hermanus Waterfall, 13.xii.52.

Polypedilum brunneum sp. n.

A small uniformly brown species, distinguished from *P. scotti* Freeman by the low A.R., dark halteres and different proportions of hypopygial structures.

Male.—Wing length 1·5 mm.

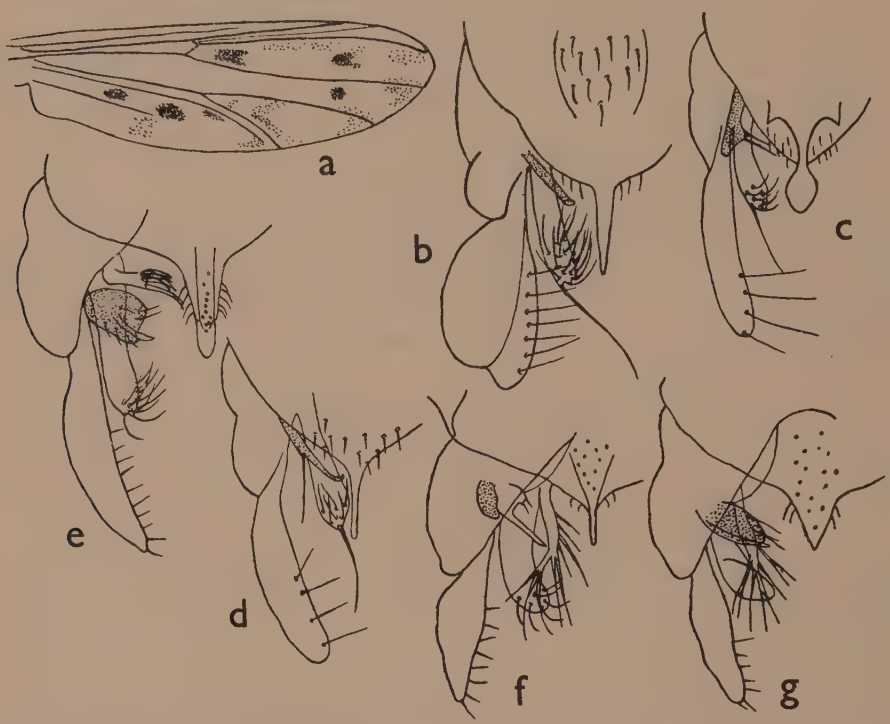


Fig. 12.—(a) Wing of *Polypedilum brevistilum*. (b)–(g) Male hypopygia. (b) *Polypedilum brevistilum*; (c) *P. pruina*; (d) *P. brunneum*; (e) *Tanytarsus aterrimus*; (f) *T. reductus*; (g) *T. linearis*.

Head, antennae and palpi brown, mouthparts slightly paler, A.R. only about 0·5. *Thorax* uniformly brown except for a yellowish tinge around the wing bases, acrostichal and dorso-central bristles long. *Legs* uniformly brown, L.R. about 1·6. *Wings* slightly greyish, R_{2+3} ending quite close to R_1, posterior fork well distal to cross vein. Halteres with brown knobs. *Abdomen* uniformly brown; hypopygium (fig. 12*d*) with long anal point, styles narrower than in *scotti*, appendage 2 shorter than anal point.

Holotype male and 6 ♂ paratypes, Hermanus Waterfall, 13.xii.52.

Polypedilum brevistilum sp. n.

A fairly large species for the genus, rather similar to *P. alticola* Kieffer but readily distinguished by the different wing pattern, especially the much smaller size of the spot in the base of cell R_5 (in *alticola* this fills the basal third of the cell).

Male.—Wing length 2·5–2·75 mm.

Head and antennae brown, palpi black, A.R. about 2. *Thorax* mottled brown, quite heavily pruinose, dorso-central and acrostichal bristles well developed and yellow. *Legs* mainly pale yellow, femora dark except for the apices which are pale; tarsi darkened at the joints, L.R. 1·25. *Wings* with markings and venation as in fig. 12*a*; halteres with dark knobs. *Abdomen* blackish, paler laterally especially in the holotype in which this part is almost yellow, all hairs pale. Hypopygium (fig. 12*b*) similar to several other species but styles swollen and appear shortened.

Female.—Similar to male.

Holotype male, W. Cape Province, Berg River, Tulbagh Barrage, 12.xi.53 (*K. M. F. Scott*). Paratypes: Belgian Congo, Elisabethville: 1 ♂, xi.1933 (*C. Seydel*) (in British Museum); 5 ♂, 6 ♀, 15–24.xii.1938, 1 ♂, 15.iii.1939 and 1 ♂, 15.iv.1939 (*J. H. Bredo*) (in Institut Royal des Sciences Naturelles de Belgique).

Polypedilum pruina sp. n.

A small species with spotted wings, grey pruinose bands on mesonotum and yellowish legs. Wing pattern not unlike *P. niveiforceps* Kieffer and *P. longicrus* Kieffer but there is no basal spot in cell M and the male hypopygium is quite distinctive.

Male.—Wing length 1·5 mm.

Head and scape dark brown, mouthparts and flagellum slightly paler, A.R. about 1·0. *Thorax* dark brown, lines of dorso-central and acrostichal bristles pruinose when lighted from the front, pruinosity changes to the stripes when direction of light changes. *Legs* yellowish, basal two-thirds of femora dark brown, L.R. about 1·7, no tarsal beard. *Wings* with brown spots as follows: cell R_5 with three, one filling the base, one across the middle, and a smaller diagonal one at the apex; cell M with a narrow tract running along M_{1+2} from its base to just beyond midway, and with a triangular spot in the apical angle; a spot near apex of fork cell; a large spot across Cu_1; a double spot in the middle of the anal cell and a small tract just above An. Halteres with brown knobs. *Abdomen* blackish with pale hairs, hypopygium (fig. 12*c*) with trilobed anal point, central lobe expanded, appendage 1 with two long hairs subapically, styles narrow with a few long hairs on inner side.

Female.—Very similar to male.

Holotype male, Rondebosch, xii.52; paratypes, Berg River, Piquetberg, 1 ♀, i.53, 1 ♂, 16.iii.53.

Tanytarsus (Tanytarsus) aterrimus sp. n.

A fairly large species for the genus, body entirely black. It falls into Edwards' Group D, Series 1, of his subgenus *Tanytarsus* s. str. Frontal tubercles absent, L.R. 2·0, pulvilli absent, anal point of male with row of dots.

Male.—Wing length 2·0–2·5 mm.

Head, mouthparts and antennae black, frontal tubercles absent, eyes bare, A.R. 0·9. *Thorax* black, stripes fused, mesonotum with some pruinosity. *Legs* brown, pulvilli absent, L.R. 2·0, combs of posterior tibiae distinctly separated, each with a spur. *Wings* normal for the group, with numerous hairs in the posterior fork, a central row along half of the basal cell and a few in An. Halteres brown. *Abdomen* black; hypopygium (fig. 12*e*) with narrow styles, appendage 1 broad, 1*a* narrow and pointed, 2*a* with simple hairs, anal point with an irregular row of dots varying in number from 4–16.

Female.—Resembles male; antennae with five segments, the last two being fused, wings rather more hairy.

Holotype male, and paratypes, 22 ♂, 1 ♀, Berg River, Assegaibos Gate 14.viii.53; 2 ♀, Berg River, Assegaibos Stream, 14.viii.53; 5 ♂, 2 ♀, Berg River, Driefontein, i–ii.53; 1 ♂, 1 ♀, Tulbagh Barrage, 12.xi.53.

Tanytarsus (Cladotanytarsus) reductus sp. n.

A tiny greenish species with yellowish scutal stripes, L.R. about 2·4, wings with reduced macrotrichia as in *T. capiensis* Freeman, but front tarsus without beard; anal point narrow and appendage 1 reduced.

Male.—Wing length 1·25 mm.

Head, mouthparts, antennae pale yellowish, A.R. about 0·75. *Thorax* very pale with slightly darker, separate, yellowish scutal stripes, scutellum and sternopleuron also yellow. *Legs* very pale, L.R. about 2·4, no tarsal beard or pulvilli. *Wings* with reduced macrotrichia, present only at extreme apices of cells R_5 and M_1 and as a line in apical half of cell R_5, vein M_1 with macrotrichia for about half its length. *Abdomen* grass green, hypopygium (fig. 12*f*) with narrow anal point and reduced appendage 1, 1*a* rather long in comparison.

Female.—Resembles male but wings more hairy; macrotrichia reach back nearly to base of cell R_5, there is a short line in cell M_1, posterior fork is bordered anteriorly, there is a small patch in fork cell, veins M_4, Cu and An with macrotrichia.

Holotype male, Berg River, Piquetberg, 5.iii.53. Paratypes: from same locality, 3 ♂, 5 ♀, i.53; 1 ♂, 1 ♀, ii.53; 3 ♂, 3 ♀, 5.iii.53; 4 ♂, 16.iii.53; 1 ♂, 1 ♀, 30.iv.53; 1 ♂, Berg River, Hermon, 16.v.52; 1 ♂, Berg River, Cecilia's Drift, 21.i.53.

Tanytarsus (Cladotanytarsus) linearis sp. n.

A small dark green species, separable from *T. capensis* Freeman by its smaller size, absence of tarsal beard, presence of macrotrichia in cell M_4 and anal cell and on veins M, Cu and An; anal point wide and triangular, appendage 1 broad.

Male.—Wing length 1·2 mm.

Head, antennae and mouthparts black, A.R. 0·75. *Thorax* with dark green background, stripes black and more or less separate, postnotum and sternopleuron black. *Legs* pale brown, L.R. about 1·8, no tarsal beard, pulvilli absent. *Wings* with macrotrichia present as a patch at apices of cells R_5, M_1 and M_4 and as lines in the centres of cells R_5 (to the base) and M_1 (for half the length of vein M_1), along each side of posterior fork veins nearly to wing base and as a line along An; in addition there is a line of macrotrichia just inside the posterior margin; posterior fringe rather long, veins M, Cu and An with macrotrichia. Halteres pale. *Abdomen* dark green; hypopygium (fig. 12*g*) with broad triangular anal point, fairly broad appendage 1, 1*a* hardly hardly longer than 1, 2 and 2*a*, and styles normal for the group.

Holotype male and 13 ♂ paratypes, Platteklip Gorge, 27.i.53.

ON *OXYTELUS PICTICORNIS* FAUVEL, WITH THE DESCRIPTIONS OF TWO ALLIED SPECIES (COLEOPTERA : STAPHYLINIDAE).

By W. O. Steel, F.R.E.S.

Oxytelus picticornis was described by Fauvel (1889 : 249) from one male specimen collected by Saves in New Caledonia. Later (1903 : 260), the same author recorded a further male. Since then, nothing has been added to the knowledge of the species and the female remains undescribed. Through the kindness of Mons. G. Fagel, it has been possible to examine one of the examples from the Fauvel collection and this enabled four further specimens (1 male, 3 females) to be identified amongst the British Museum material. Descriptions of both sexes are given below, together with those of two allied new species, *O. kraussi* and *O. tinchialitensis*, also from New Caledonia.

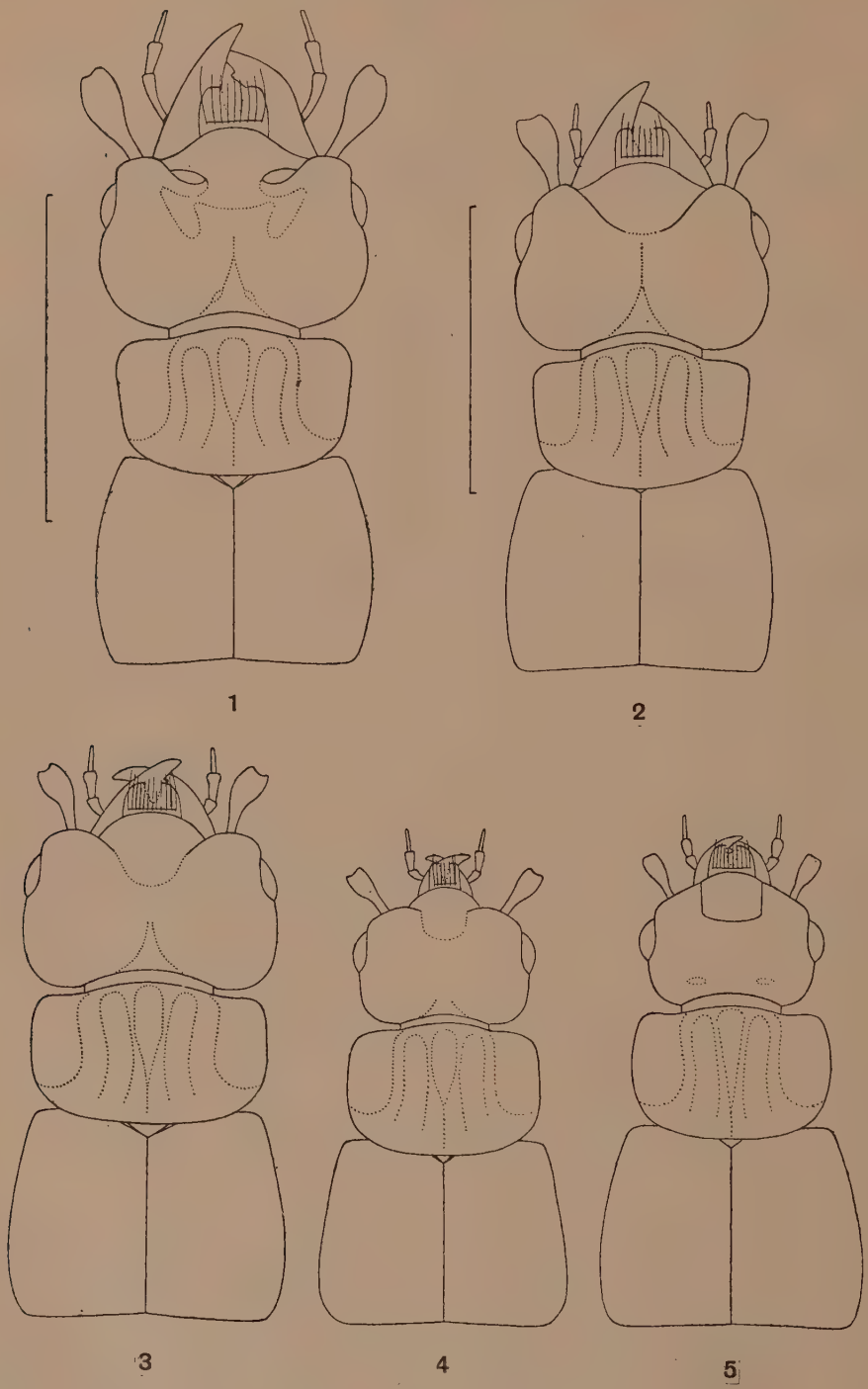
In most species of *Oxytelus*, the male varies to a greater or less extent in size and development, and *O. kraussi*, the only species dealt with here of which any number of this sex was available, is no exception. The males here show a marked variation in size and, associated with this, differences in the development of the head and pronotum, the length of the post-ocular region relative to the eyes, the development of the mandibles and the extent and type of the ground sculpture of the head. The two extremes are described as "♂ major" and "♂ minor," there being a gradual transition between these forms. Only two males of *O. picticornis* and one of *O. tinchialitensis* have been examined, all of these being major forms. There would appear, however, to be little doubt that the study of further material will show these to vary in the same way as *kraussi*, in which case some forms of *kraussi* and *picticornis*, which are almost identical in colour, will probably be very close, though always separable by the secondary sexual characters which are constant. The colour of *tinchialitensis* is very different.

Oxytelus (Anotylus) picticornis Fauvel, 1889 (figs. 1, 8).

Head and pronotum dark brown to almost black, the antennal tubercles yellowish in front, elytra dark brown to almost black, base and humeri rather sharply yellowish, abdomen dark brown, the paratergites sometimes lighter. Antennae with first to fourth, eleventh and sometimes tenth, segments light yellowish-brown, the first sometimes darker, the rest almost black. Mandibles, palpi and legs lighter or darker yellowish-brown.

Male (major).—Head, pronotum and abdomen shining, the elytra dull.

Head large, strongly transverse, distinctly broader than the pronotum, the eyes small, the post-ocular region about twice as long as the eye (seen from above), rounded, the antennal tubercles well developed, their anterior margins extending inwards and then recurved, clypeus and an area between and, on each side, behind the antennal tubercles, depressed, internal to each eye with a rather broad, superficial, oblique impression, at base with two indistinct, converging, impressed lines which unite to form a short central channel with a small fovea on each line. Surface of clypeus, the antennal tubercles and the impressed areas between and behind these, smooth and impunctate, the clypeus with traces of an alutaceous ground sculpture in front, the rest of the head with a strong ground sculpture which is partly alutaceous and partly longitudinally vermiculate, without visible



FIGS. 1–5.—Head, pronotum and elytra of: (1) *Oxytelus picticornis* Fvl., male (major); (2) *O. tinchialitensis* sp. n.; male (major); 3–5, *O. kraussi* sp. n.; (3) male (major); (4) male (minor); (5) female. The scales = 1 mm., figs. 3–5 are to the same scale as 1.

punctures except for a rather narrow median area where the ground sculpture is less close, the punctures here very fine and rather close. Mandibles large, maxillary palpi very long, particularly the second segment, which is about three-quarters as long as the next two together. Antennae long, reaching (if extended backwards) to beyond the middle of the elytra, the first segment long, strongly dilated apically, the second considerably shorter and narrower than the first, more than twice as long as broad, the third distinctly longer than second, the fourth as broad as third and much shorter, longer than broad, the fifth about as long as and a little broader than the fourth, slightly longer than broad, the sixth to eighth subequal, a little broader than the fifth, quadrate, the ninth and tenth subequal, as wide as and distinctly longer than the eighth, longer than broad, the eleventh nearly one and one-half times as long as the tenth, bluntly pointed apically. Neck strongly alutaceous.

Pronotum strongly transverse, about one and one-half times as broad as long, narrowed towards base, the anterior angles rounded, the sides straight, the posterior angles broadly rounded, the base rounded ; broadly impressed at sides (except basally) and with three longitudinal impressions on disc, surface with an alutaceous ground sculpture of variable intensity in the impressions, elsewhere with a moderately close, very fine puncturation.

Elytra about one and two-thirds times as broad as the sutural length which is slightly (less than one and one-fifth times) longer than the pronotum, about as broad as head, broadest behind middle, the sides rounded, moderately closely and finely punctured, the punctures being almost hidden by a very strong and close longitudinally strigose ground sculpture.

Abdomen : Tergites very finely and rather closely punctulate and with a weak alutaceous ground sculpture. Sternite of sixth segment obliquely produced backwards, the posterior margin pointed in the middle, that of seventh segment produced backwards into a short median plate which is broadly triangularly emarginate apically, the emargination with a fringe of setae, sternite of eighth segment produced backwards in the middle into a small triangular plate which is rounded apically, broadly emarginate on each side of this.

Length : 3·1 mm.

Female.—Head, pronotum and elytra dull, the abdomen shining. In facies similar to *kraussi* (fig. 5).

Head rather small, narrower than the pronotum, the antennal tubercles not prominent, the clypeus rounded in front, scarcely depressed, separated from the remainder of the head by a suture, surface strongly and rather coarsely alutaceous, without visible puncturation, on each side in front of base with a small fovea. Mandibles and maxillary palpi normal. Antennae short, reaching (if extended backwards) hardly as far as base of pronotum, the first segment shorter and much less dilated apically than in male. second longer than broad, third longer than the second, fourth quadrate, fifth wider than fourth, transverse, sixth to tenth transverse, becoming gradually wider, sixth to eighth about equal in length, ninth and tenth a little longer, eleventh longer than tenth, bluntly pointed.

Pronotum transverse, a little less than one and one-half times as broad as long, not noticeably narrowed basally, the anterior angles rounded, the sides lightly rounded, the posterior angles more sharply rounded than in *kraussi* (fig. 5), the base rounded ; broadly and superficially impressed at sides (except basally), the disc with three lightly marked longitudinal impressions, surface with a strong alutaceous ground sculpture similar to that on head, without visible punctures, sometimes with a narrow, indistinct, less strongly sculptured area on the mid-line near base.

Elytra similar in sculpture to those of male but somewhat less transverse, the sutural length not quite one and one-third times as long as the pronotum.

Abdomen : Tergites sculptured as in male, that of eighth segment evenly convex and with the posterior margin lightly rounded.

Length : 2·5–2·6 mm.

New Caledonia : Saint-Louis, on bank of stream (*Saves*) (type) ; Coulée Boulari (in Fauvel collection) ; Pampai, 14.xi.1914 (*P. D. Montagu*) (in British Museum (Natural History) collection).

Type in the collection of Institut Royale des Sciences Naturelles, Brussels.

In the two males examined of this species, the antennae and also the maxillary palpi are very long for the genus. Should smaller male forms occur (see introduction), these will probably show a reduction in the size of these appendages.

Oxytelus (Anotylus) kraussi sp. n. (figs. 3–6).

Head black, the antennal tubercles and clypeus yellowish in front, pronotum black, the sides sometimes narrowly and obscurely yellowish, elytra black, the base and humeri rather sharply yellowish, abdomen black or almost black, the paratergites sometimes yellowish in part, the apex sometimes brownish. Antennae with first to fourth, tenth and eleventh and sometimes ninth, segments light yellowish-brown. Mandibles, palpi and legs yellowish-brown.

Male (major).—Head, pronotum and elytra shining, the elytra dull.

Head large, transverse, a little broader than the pronotum, the eyes small, the post-ocular region slightly more than twice as long as the eye (seen from above), the sides lightly rounded, the posterior angles broadly rounded, the antennal tubercles well developed, their anterior margins extending inwards, the clypeus depressed, internal to each eye with traces of an oblique impression, at base with two indistinct, converging, impressed lines. Surface of clypeus and antennal tubercles smooth and impunctate, the former with traces of an alutaceous ground sculpture in front, the rest of the head with a strong ground sculpture which is partly alutaceous and partly longitudinally vermiculate except for a moderately broad median area which is very finely and rather closely punctured and almost without ground sculpture. Mandibles rather large, maxillary palpi not abnormally long. Antennae moderately long, reaching (if extended backwards) slightly beyond the base of the pronotum, the first segment long, strongly dilated apically, second much shorter and narrower than first, less than twice as long as broad, third longer than second, fourth as broad as third, and much shorter, quadrate, fifth about as long as and a little broader than the fourth, slightly transverse, sixth to eighth about equal in length, a little broader than the fifth, very slightly transverse, ninth and tenth subequal in length, as broad as and a little longer than the eighth, quadrate, eleventh nearly twice as long as the tenth, bluntly pointed. Neck strongly alutaceous.

Pronotum strongly transverse, nearly one and two-thirds times as broad as long, scarcely narrowed basally, the anterior angles rounded, the sides very lightly rounded, the posterior angles broadly rounded, the base rounded ; broadly impressed at sides (except basally) and with three longitudinal impressions on disc, surface with an alutaceous ground sculpture of variable intensity in the impressions, this being sometimes absent in the median one, elsewhere with moderately close, very fine punctures.

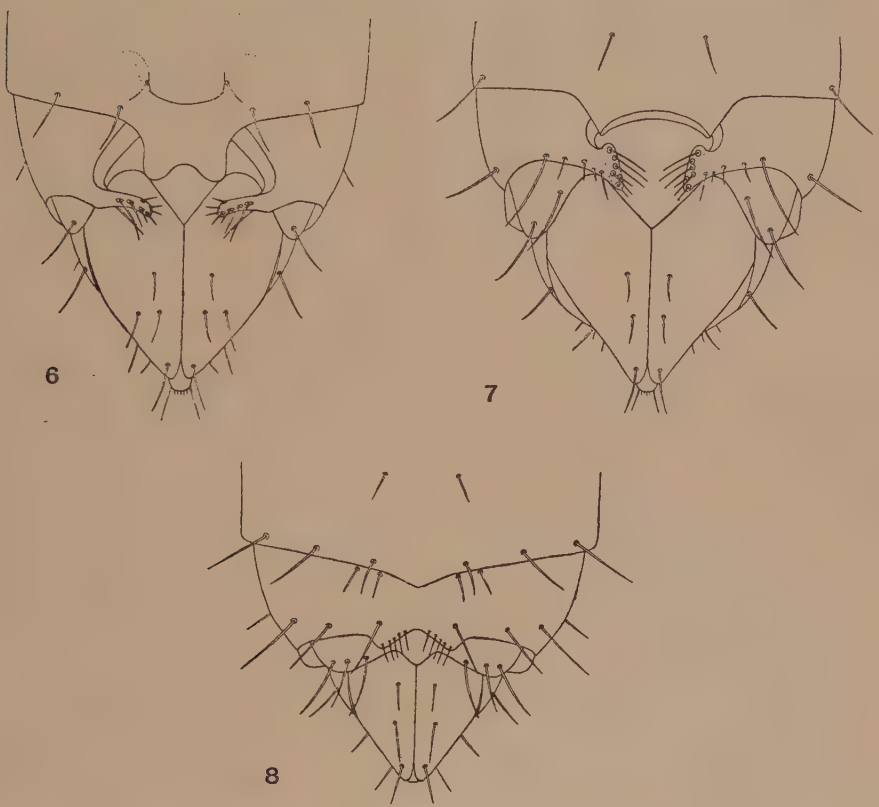
Elytra similar in shape and sculpture to *picticornis*, the sutural length about one and one-fifth times as long as the pronotum.

Abdomen : Tergites as in *picticornis*. Sternite of sixth segment produced backwards into a rather broad median plate, the posterior margin of which is emarginate in the middle and rounded on each side, in front of this plate with a rather broad flattened tubercle, sternite of seventh segment deeply and broadly excavate in the middle, the posterior angles of the excavation produced inwards into narrow, apically rounded, processes, each of which bears several setae, the sides of the excavation strongly deflexed, sternite of eighth segment produced backwards in the middle into a broad pointed triangular plate, deeply and broadly emarginate on each side of this.

Length : 3·0 mm.

Male (minor).—Head and pronotum a little less shining than in male major.

Head rather small, transverse, a little narrower than the pronotum, the eyes relatively larger, the post-ocular region scarcely longer than these (seen from above), the sides almost straight and slightly converging, the posterior angles rounded, the antennal tubercles much less developed, the clypeus depressed, without traces of an impression internal to each eye. Clypeus rather strongly alutaceous, antennal tubercles smooth and impunctate in front, rest of head with a strong ground sculpture which is mainly alutaceous and which obscures to some extent the puncturation of the median area. Mandibles rather small. Antennae a little shorter than in male major and with the first segment somewhat less dilated apically.



Figs. 6–8.—Sternites of sixth to ninth abdominal segments of male of: (6) *O. kraussi* sp. n.; (7) *O. tinchialitensis* sp. n.; (8) *O. picticornis* Fvl.

Pronotum less transverse, only a little more than one and one-half times as broad as long, the ground sculpture somewhat stronger.

Elytra broader than the head, similar in proportions and sculpture to those of male major.

Abdominal tergites and secondary sexual characters as in male major.

Length: 2·7 mm.

Female.—Head, pronotum and elytra dull, the abdomen shining. In form and sculpture very similar to *picticornis*, but with third antennal segment hardly longer than the second and the fifth to tenth a little more transverse. The posterior angles of the pronotum are more broadly rounded and there is always a distinct, narrow, shining, non-alutaceous

area on the mid-line near the base. Tergite of the eighth abdominal segment depressed in the middle, except in front, the apical margin broadly emarginate.

Length: 2·4–2·7 mm.

New Caledonia: Bois du Sud, in puffball fungus, viii.1950 (*N. L. H. Krauss*), 7 males and 17 females.

Holotype (male major) and allotype in the collection of the writer, paratypes in the collection of the author and that of Mr. N. L. H. Krauss.

This species is almost identical with *picticornis* in colour, except that the antennae have always the tenth segment and sometimes the ninth light yellowish-brown. The male differs markedly in the secondary sexual characters and the major form in the shape and structure of the head, the shorter antennae and maxillary palpi and the more transverse pronotum which is scarcely narrowed towards the base. The female differs as noted in the description, the secondary sexual modification of the tergite of the eighth abdominal segment in this sex is very unusual in the genus, if not unique.

I have pleasure in naming this insect after Mr. N. L. H. Krauss of Honolulu, Hawaii, to whom I am indebted for various Staphylinids collected in New Caledonia and elsewhere.

Oxytelus (Anotylus) tinchialitensis sp. n. (figs. 2, 7).

Male (major).—Head, pronotum and abdomen shining, the elytra dull. Head and pronotum black, the antennal tubercles narrowly yellowish in front, elytra almost black, the humeri narrowly and obscurely yellowish, abdomen black. Antennae with first segment black, second to fourth light yellowish-brown, fifth to tenth black, eleventh black with the apex obscurely yellowish. Maxillary palpi with the first three segments black, the last light yellowish-brown, mandibles dark brown. Femora dark brown, tibiae with about basal two-thirds dark brown, the rest yellowish-brown, tarsi light yellowish-brown.

Head large, transverse, broader than the pronotum, the eyes small, the post ocular region about twice as long as the eye (seen from above), rounded, antennal tubercles well developed, similar to those of *kraussi*, but narrower in front. Sculpture as in *kraussi* (large specimens). Antennae similar to those of *kraussi* but a little longer. Mandibles large, maxillary palpi normal.

Pronotum about one and one-half times as broad as long, narrowed towards base, anterior angles rounded, the sides straight, posterior angles broadly rounded, base rounded. Sculpture as in *kraussi*.

Elytra very slightly broader than head, of the same shape and sculpture as in the preceding two species, the sutural length less than one and one-fifth times as long as the pronotum.

Abdomen: Tergites as in the two preceding species. Sternite of sixth segment produced backwards into a very short, broad, median plate, which is emarginate apically over its whole width and pointed on each side of the emargination, sternite of seventh segment deeply and broadly excavate in the middle, the posterior angles of the excavation produced inwards into rather broad, apically truncate processes, each of which bears several setae, the sides of the excavation strongly deflexed, sternite of the eighth segment produced backwards in the middle into a broad pointed triangular plate as in *kraussi*, deeply and broadly emarginate on each side of this.

Length: 3·25 mm.

Female.—Unknown.

New Caledonia: Tinchialit, in wood, 21.ix—3.x.1949 (*L. E. Cheesman*), 1 male.

Type in the British Museum (Natural History) collection.

Distinct from both the preceding species in the colour and the male secondary sexual characters. It also differs from *picticornis* in the structure of the head and the shorter antennae and maxillary palpi and from the major form of *kraussi* in the shape of the head and pronotum and the slightly longer antennae.

Acknowledgments.

Thanks are due to Mr. N. L. H. Krauss for specimens of *O. kraussi*, to Mons. G. Fagel for the loan of a specimen of *O. picticornis* and to Mr. J. Balfour-Browne for making available the New Caledonian material in the British Museum collection.

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A NEW GRASSHOPPER FROM THE CENTRAL HIMALAYAS (ORTHOPTERA: ACRIDIDAE).

By D. R. Ragge, Ph.D., F.R.E.S.

The large series of specimens on which this species is based was collected in 1952 by H. F. Lamprey while on the Oxford University Expedition to the Central Himalayas (leader J. B. Tyson). Its chief feature of interest is the more or less straight hind margin of the pronotum, which in most Acrididae is strongly convex, or with a large median indentation as in many of the high altitude forms of Southern Asia. On the basis of the characters of the head and pronotum the species might well be regarded as being generically distinct, but, in the absence of the male sex and in view of our poor knowledge of Himalayan Orthoptera, I have chosen to place it in the genus of its closest apparent relative, *Anaptygus uvarovi* (Chang, 1937).

Anaptygus rectus sp. n.

Diagnosis.—Hind margin of pronotal disc straight or nearly so or with slight median indentation. Ocelli almost absent. Foveolae present but poorly developed. Hind femora about four times longer than their maximum width. Tympanum well developed.

Female.—Vertex without median carinula; foveolae poorly developed, shallow, with rounded ends. Frontal ridge prominent for all or most of its length, broad, convex above, sulcate in ocellar region, flat or slightly sulcate below. Median and lateral ocelli very small, almost obsolete. Facial keels weak, curved. Antennae as long as head and pronotum together, filiform, depressed.

Pronotum with well-developed median and lateral keels. Typical transverse sulcus well developed, produced forwards in middle. Prozona as long as its maximum width. Hind margin of disc straight or nearly so or with slight median indentation. Lateral pronotal lobes sculptured as in fig. 1b. with two slightly sinuous vertical sulci. Mesonotum just covered by pronotum. Metanotum centrally exposed, with a median ridge. Prosternum flat. Meso- and metasternum together wider than long, almost glabrous. Mesosternal lobes smoothly rounded, transverse, as wide as their interspace. Metasternal lobes slightly wider than their interspace, which is transverse. Hind femora about four times longer than their maximum width, with 12–14 "fish-bone" marks on outer side. Hind tibiae with 9 inner and 9 outer spines; outer apical spine absent. Fore wings reduced to dorsolateral flaps, their exposed part about as long as pronotum. Sc, R, and 1A, fairly well developed; C, M, Cu_1, and 2A, feebly developed; Cu_2 absent; all these veins unbranched (terminology of Ragge, *in press*). Hind wings vestigial.

Abdomen subcylindrical, with median dorsal ridge. Tympanum well developed, open. Cerci short, conical. Valves of ovipositor robust, of moderate length.

Coloration doubtful as specimens had been in formalin and then spirit. General colour reddish-brown. Antennae becoming black in distal half. Lateral pronotal lobes with black markings, notably in antero- and posterodorsal regions. Pronotal disc with black markings in posterior angles. Hind femora red ventrally. Knees black. Hind tibiae red; hind tibial spines and spurs with black tips. Abdomen with broad black stripe on each side.

Male unknown.

Measurements.—The dimensions given here refer to specimens which had been dried

subsequent to preservation in formalin and then spirit. The number of specimens measured in each case is given in parenthesis; all measurements are in millimetres.

Total length (21) : 17–23, mean 20·0.
Maximum width of head (21) : 3·5–4·2, mean 3·90.
Height of eye (21) : 1·6–2·0, mean 1·76.
Length of antenna (13) : 7–8, mean 7·4.
Median length of pronotum (21) : 3·7–4·5, mean 4·01.
Width of anterior margin of pronotal disc (21) : 2·0–2·6, mean 2·15.
Width of posterior margin of pronotal disc (21) : 3·3–4·1, mean 3·63.
Length of hind femur (21) : 11–13, mean 11·9.
Maximum vertical width of hind femur (21) : 2·7–3·3, mean 2·97.
Length of fore wing (21) : 3·8–5·1, mean 4·36.

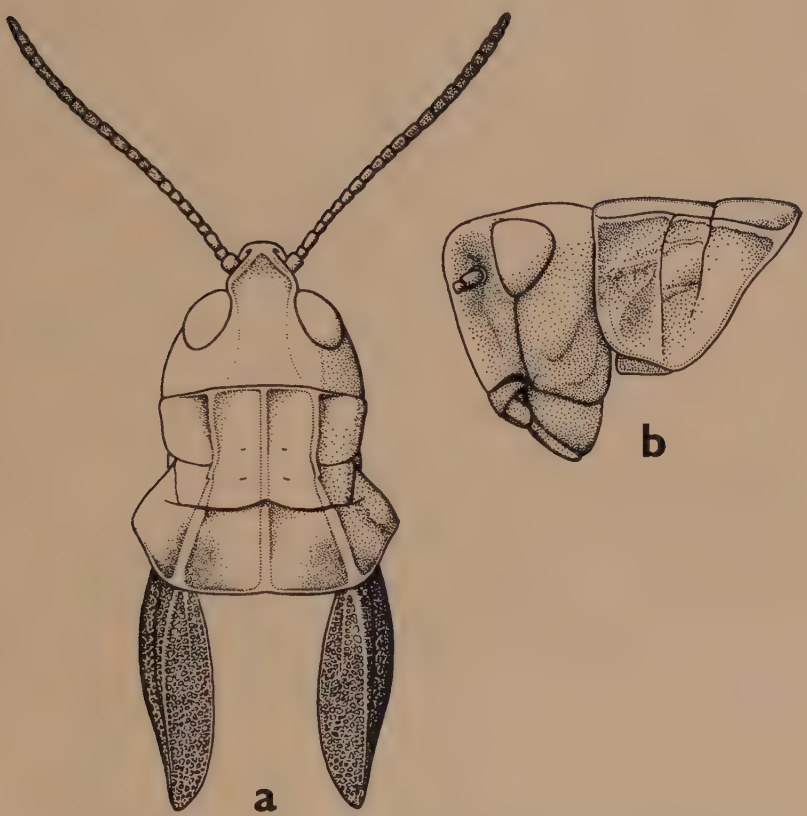

Fig. 1.—*Anaptygus rectus* sp. n. (*a*) Head, pronotum and fore wings, dorsal view. (*b*) Head and pronotum, lateral view.

Holotype ♀, India, Central Himalayas : Tehri-Garhwal, 13,000–17,000 ft., in alpine meadow, 1952 (*H. F. Lamprey*). In the British Museum (Natural History).

Variation.—The frontal ridge varies in its degree of prominence. The indentation in the hind margin of the pronotum may be absent, very slight,

or well-marked though small. In some specimens the lateral pronotal carinae are angularly inflexed in the prozona : in others they are gently curved.

Discussion.—This species belongs to the subfamily Acridinae and shows affinities to the alpine genera *Ptygippus* Mistshenko, 1951, *Ptygonotus* Tarbinsky, 1927, and *Oreoptygonotus* Tarbinsky, 1927 ; it appears to be most closely related to *Oreoptygonotus uvarovi* Chang, 1937, a species from W. China. *Anaptygus* Mistshenko, 1951, was erected for the latter species on the basis of such characters as the well-developed tympanum and weakly excised hind margin of the pronotum ; the only other known species of *Oreoptygonotus* Tarbinsky is the type species *O. tibetanus* Tarbinsky, 1927, which has no tympanum and a strongly excised hind margin to the pronotum. I have therefore placed the species here described in *Anaptygus* Mistshenko. It differs from *Anaptygus uvarovi* (Chang) mainly in having poorly developed foveolae, more strongly divergent lateral pronotal carinae, and a straight or only very slightly excised hind margin to the pronotal disc.

Anaptygus Mistshenko may be distinguished from *Ptygippus* Mistshenko (Caucasus) by the poorly developed ocelli and regularly curved lateral pronotal carinae (irregularly sinuous in *Ptygippus* Mistshenko), and from *Ptygonotus* Tarbinsky (W. China) by the presence of foveolae on the vertex.

Material examined.—♀ holotype, 20 pinned ♀ paratypes, and 58 further ♀ paratypes in spirit, all with the same data as the holotype.

Acknowledgments.

I wish to thank Dr. B. P. Uvarov for his helpful comments and Miss P. M. Stock for her practical assistance.

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ÜBER DIE ARTEN DER MELOIDEN-GATTUNG *ZONITODEMA* PÉRINGUEY (COLEOPTERA).

Von Dr. Z. Kaszab.

(*Ungarisches Naturwissenschaftliches Museum, Budapest, Ungarn*).

Die Gattung *Zonitodema* Péringuey enthält ausschliesslich tropisch-afrikanische Arten. Es sind bisher 10 Arten bekannt geworden, für welche aber bisher keine Bestimmungstabelle existierte, so dass man nur auf die meist sehr kurzgehaltenen, oft kaum brauchbaren Einzelbeschreibungen angewiesen ist. Bei der Bearbeitung der südafrikanischen Meloiden-Fauna beschäftigte ich mich nun auch mit dieser Gattung und auf Grund eines sehr reichhaltigen Materials aus verschiedenen Gegenden Afrikas ist es mir gelungen, die Arten dieser Gattung zu klären.

Für meine Untersuchungen lagen die Sammlung des British Museum (Natural History), in London, South African Museum, in Cape Town, Transvaal-Museum, in Pretoria, Musée du Congo Belge, in Tervuren, etc., ausserdem noch das Material des Ungarischen Naturwissenschaftlichen Museums in Budapest zur Verfügung. Für die Überlassung des Materials zur Aufarbeitung spreche ich auch hier meinen innigsten Dank aus. Besonders bin ich Herrn E. B. Britton und Fraulein Christine M. F. von Hayek in British Museum, A. J. Hesse in Cape Town, C. Koch in Pretoria und P. Basilewsky in Tervuren, zu grossem Dank verpflichtet.

Im folgenden gebe ich eine Bestimmungstabelle der sämtlichen bisher beschreibenen Arten und beschreibe drei neue Arten und eine neue Form.

Bestimmungstabelle der Arten:

1 (4) Flügeldecken gelb, Halsschild ebenfalls gelb, Kopf schwarz, ohne Metallschimmer.

2 (3) Beine gelb, nur die Trochanteren und Coxen, sowie die Knie und das Ende der Schienen etwas verdunkelt, die Tarsen werden gegen das Ende ebenfalls bräunlich. Kopf sehr dicht, fast runzelig punktiert, dazwischen chagriniert und matt. Halsschild parallelseitig, so breit wie der Kopf, fein und dicht punktiert, der Grund chagriniert und fettglänzend. Flügeldecken dicht und erloschen punktiert. Fühler lang und dünn. Lobus maxillaris mit seinem haarartigen Ende deutlich kürzer als die Maxillarpalpen selbst. Länge: 9,5–10 mm. Natal (Drakensberg) . . . . . 1. **hayekae** sp. n.

3 (2) Beine einfärbig schwarz, Fühler und Palpen, sowie die Unterseite dunkelbraun, die beiden letzten Abdominalsegmente aber, sowie die übrigen Segmente ebenfalls gelb (Männchen). Halsschild kugelig, so breit wie der Kopf an den Augen, fein und spärlich punktiert, glänzend. Lobus maxillaris mit seinem haarartigen Ende länger als die Maxillarpalpen selbst. Länge: 6–7 mm. Süd-Afrika (Fransch Hoek. Ceres) Tanganyika. 2. **rufipennis** Pic.

4 (1) Flügeldecken metallisch grün oder blau.

5 (6) Kopf und Halsschild, sowie die ganze Unterseite, Beine und Schildchen, weiter die Mundteile gelbrot, Fühler vom 2. Glied an, das Ende der Mandibeln, das Endglied der Labialpalpen, sowie die zwei letzten Glieder der Maxillarpalpen dunkel. Tarsen, sowie die Vorderhüften oben braun, Hinterbrust vorne erloschen verdunkelt. Halsschild quer, erloschen und grob punktiert, Kopf breit, Schläfen hinter den Augen stark erweitert, Stirn flach, grob und dicht punktiert. Lobus maxillaris kaum etwas länger als die Maxillarpalpen. Flügeldecken metallisch grün, sehr dicht und grob, die Querrichtung zusammenfliessend punktiert. Länge: 7–11 mm. Cape Colony (Swellendam, Namaqualand) . . . . . 3. **ruficeps** Péringuey.

6 (5) Kopf glänzend schwarz, nicht rötlich, höchstens sehr selten dunkel braunrot, aber die Schläfen unten dunkelbraun.

7 (8) Beine, sowie die ganze Unterseite, Halsschild und Schildchen gelbrot. Fühler braunrot, das Ende etwas verdunkelt oder braunschwarz, die Basalglieder aber braun. Halsschild nur wenig breiter als lang, äusserst spärlich und sehr fein punktiert, Hinterrand in der Mitte etwas ausgeschnitten. Kopf deutlich schmäler als der Halsschild, Schläfen hinter den Augen lang und hinten etwas buckelig, spärlich und grob, vorne auch dicht punktiert. Flügeldecken blaugrün, grob und dicht, aber kaum zusammenfliessend punktiert. Kopf glänzend schwarz (forma typica), oder oben braunrot, unten dunkelbraun (ab. **flaviceps** ab. n.). Länge: 5–9,5 mm. Abessinien, Erythraea, Nigeria, Französisch-Kamerun, Belgisch Kongo . . . . 4. **erythraea** Pic.

8 (7) Beine und Fühler, sowie die Unterseite schwarzbraun, nur das Abdomen teilweise oder ganz rot.

9 (16) Halsschild einfärbig rotgelb.

10 (11) Unterseite, auch das ganze Abdomen dunkelbraun oder schwarz. Flügeldecken braun mit metallischem Schimmer. Lobus maxillaris nur um ein wenig länger als die Palpen. Kopf sehr dicht und tief punktiert, fast runzelig. Halsschild feiner und spärlich punktiert. Länge: 6–8 mm. Natal (Eshowe), Transvaal (Lydenburg). . . . . 5. **proxima** Péringuey.

11 (10) Das Abdomen zum Teil (Männchen) oder gänzlich (Weibchen) rotgelb. Beim Männchen sind die letzten zwei oder drei Segmente rotgelb gefärbt.

12 (15) Lobus maxillaris kaum etwas oder höchstens nur um ein Drittel länger als die Maxillarpalpen, die zugespitzte haarartige Verlängerung des Lobus maxillaris nicht länger als der glänzende Basalteil.

13 (14) Lobus maxillaris kaum merklich länger als die Maxillarpalpen, die behaarte Verlängerung desselben nicht länger als das Endglied der Palpen. Flügeldecken metallisch grün oder blaugrün, grob und dicht, in Querrichtung ziemlich zusammenfliessend punktiert. Halsschild kugelig, sehr spärlich und fein punktiert. Kopf breit und kurz, mit grossen, buckeligen Schläfen, sehr grob, aber spärlich tief punktiert. Länge: 6–10 mm. Cape Colony (Port Elisabeth, Kirstenbosch), Natal (Frere, Drakensberg), Transvaal (Pretoria, Barberton, Congalla), Tanganyika (Kigonsera, Nyunzu). (= ? *posoka* Wellm.). 6. **parentalis** Péringuey.

14 (13) Lobus maxillaris um ein Drittel länger als die Maxillarpalpen, die behaarte, zugespitzte Zunge deutlich länger als das Endglied der Palpen. Flügeldecken meist blaugrün, grob und dicht, zusammenfliessend punktiert, die Punktierung des Halsschildes äusserst spärlich und fein, Kopf aber dicht und grob punktiert, die Mittellinie breit unpunktiert. Länge: 6–11 mm. Cape Colony (Cape Town, Stellenbosch, Worcester, Paarl, Ceres, Malmesbury, King Williamstown, Aliwal North, Outdshoorn), Transvaal (Bocksburg, Pietersburg, Pretoria, Lydenburg, Potschefstroom), Natal (Algoa Bay), Tanganyika (Lusaka) 7. **viridipennis** Fabricius.

15 (12) Lobus maxillaris äusserst lang und dünn, mit dem behaarten zungenartigen Teil mehr als doppelt so lang wie die Maxillarpalpen selbst. Flügeldecken grün, selten mit kupferigem Schimmer, meist aber blaugrün oder blau, dicht und grob punktiert. Halsschild kugelig, erloschen und fein, Kopf grob und dicht punktiert, die Mittellinie aber breit punktfrei. Länge: 7–11 mm. Betschuanaland (Mafeking), Southern Rhodesia (Salisbury, Plumtree, Manica), Nordwest-Rhodesia (Kashitu), Tanganyika (Madibira, Ukerewe, Mangu, Moschi), British E. Afrika (Kavirondo), Uganda (Bweya, Entebbe), Abessinien (Ghinda, Gatelo Amaiyu), Belgisch Kongo (Lualaba). (= *coeruleus* Fairm., *fahraei* Pér.). . . . . 8. **collaris** Laporte.

16 (9) Halsschild schwarzbraun oder rotgelb mit je zwei schwarzen Flecken an der Basis.

17 (20) Halsschild rotgelb mit je zwei schwarzen Flecken an der Basis.

18 (19) Halsschild quer, stark gewölbt, Seiten breit rundlich, Oberfläche grob und unregelmässig punktiert, der Grund ist dazwischen mikroskopisch chagriniert und gerunzelt, daher fettglänzend. Die Mittellinie des Halsschildes tief und scharf. Kopf grob und dicht punktiert, ohne ausgesprochene punktfreie Mittellinie. Lobus maxillaris samt dem zungenartigen behaarten Teil fast doppelt so lang wie die Maxillarpalpen. Länge: 9–10 mm. Uganda (Arua), Tanganyika (Tamba, Dar-es-Salaam), Belgisch Kongo (Lemfu). . . . . 9. **notatithorax** Pic.

19 (18) Halsschild etwa so lang wie breit, Seiten in gleichmässigem Bogen weniger gerundet, äusserst spärlich und ziemlich fein mit einzelnen Punkten besetzt, dazwischen ist der Grund glatt und glänzend. Kopf grob, aber sehr spärlich punktiert. Flügeldecken blau, sehr grob und tief, in Querrichtung zusammenfliessend. Lobus maxillaris ebenfalls sehr lang und dünn. Länge: 5 mm. Britisch Ostafrika (Ukamba). . . . . 10. **bimaculatithorax** sp. n.

20 (17) Halsschild einfärbig schwarzbraun, die umgeschlagenen Seiten aber heller braun.

21 (22) Das Abdomen bei beiden Geschlechtern einfärbig gelbrot. Flügeldecken lebhaft blau oder blaugrün, grob und dicht punktiert, aber kaum zusammenfliessend. Halsschild kugelig, spärlich und fein punktiert, hinten mit scharfer, aber kaum eingedrückter Mittellinie. Kopf breit, mit starken nach aussen gerichteten Schläfen-Ecken, sehr grob und dicht punktiert, die punktierung wird aber besonders in der Mitte spärlich. Lobus maxillaris lang und dünn. Länge: 6–10 mm. Belgisch Kongo (Stanleyville), Uganda (Between Kumi, Mbale Kumi), Kenya

(Kabete), Britisch Ostafrika (Kavirondo, Mt Elgon), Tanganyika (Ukerewe). . . . . 11. **nigrithorax** Pic.

22 (21) Das Abdomen auch beim Weibchen schwarzbraun oder braun, höchstens die letzten zwei Segmente rotgelb.

23 (24) Die dicht behaarte Zunge des Lobus maxillaris kaum etwas länger als die Maxillarpalpen selbst. Kopf schmäler und länger, die Schläfen hinter den Augen lang und ein wenig parallel. Augen weniger gewölbt, Stirn grob und dicht punktiert, die Mittellinie aber breit punktfrei. Hinten am Scheitel ist die Punktierung spärlicher. Halsschild kugelig, unregelmässig spärlich, an den Seiten grob, auf der Scheibe feiner punktiert. Flügeldecken blaugrün, dicht und grob, zusammenfliessend punktiert. Länge: 7 mm. Abessinien. . 12. **nigricollis** Beauregard.

24 (23) Die dicht behaarte Zunge des Lobus maxillaris sehr lang und dünn, deutlich mehr als doppelt so lang wie die Maxillarpalpen. Kopf breiter, grob, aber spärlich punktiert, die Mittellinie hinten breit unpunktiert, die Augen sind stärker gewölbt. Halsschild schmäler, äusserst spärlich und fein punktiert, Seiten stark gerundet. Flügeldecken metallisch blau, erloschen und grob punktiert. Länge: 6–7 mm. Belgisch Kongo (Lualaba, Elisabethville). . . . . 13. **brittoni** sp. n.

Zonitodema hayekae sp. n.

Halsschild, Schildchen und Flügeldecken, sowie das Abdomen gänzlich (Weibchen) oder nur die beiden letzten Segmente (Männchen), weiter die Beine gelb, Kopf und die Mittel- und Hinterbrust, die Trochanteren und Coxen, die Knie und Fühler schwarz, das Ende der Schienen sehr schmal, und die Tarsen gegen das Ende, bräunlich. *Kopf* länglich oval, mit flach gewölbten, grossen, fein fazettierten Augen, Schläfen hinter den Augen etwa so lang wie der Querdurchmesser eines Auges, abgerundet, Kopf hinten am Scheitel nur wenig nach hinten ausgezogen. Stirn in der Quere gewölbt, breit und vorne zwischen den Fühlerwurzeln etwas in seiner ganzen Breite vertieft, Clypealsutur nur wenig eingedrückt. Oberseite sehr dicht und auch grob, fast zusammenfliessend punktiert, auf der Stirn wird die Punktierung hie und da gerunzelt. *Fühler* lang und dünn, die Mitte des Körpers erreichend, das 2. Glied doppelt so lang wie breit und fast so lang wie das 3., die Glieder vom 3. an bis zum Ende allmählich sehr wenig kürzer werdend, das Endglied aber so lang wie das 3. Maxillarpalpen dünn und gestreckt, das behaarte, dünne Ende des Lobus maxillaris etwa so lang wie das Endglied der Palpen und der ganze Lobus maxillaris bedeutend kürzer als die Palpen selbst. *Halsschild* gerade, so lang wie breit, oder etwas länger, in der Mitte am breitesten, Seiten breit gerundet, nach hinten sehr wenig, oder nicht, nach vorn stark verengt, Basalrand fein aufgewölbt, Scheibe beiderseits hinter der Mitte leicht eingedrückt. Oberseite spärlich und fein punktiert, zwischen der Punktierung grob chagriniert und daher matt. *Flügeldecken* mit abgerundeten Schulterbeulen, welche innen schwach begrenzt sind, parallelseitig, quer gewölbt und die Seiten stark abfallend. Oberseite dicht und erloschen punktiert, sehr fein und kurz, gelblich behaart. *Unterseite* ebenfalls sehr fein und kurz, gelb behaart, äusserst fein und spärlich, körnelartig punktiert, glänzend. *Beine* dünn und lang, der äussere Enddorn der Hinterschienen dicker als der innere. Tarsen sehr dünn, viel länger als die Schienen, das 1. Glied der Hintertarsen gerade, so lang wie die beiden folgenden Glieder zusammen.

Länge: 9,5 bis 10 mm. *Breite:* 3 mm.

Zwei Exemplare, Holo- und Paratypus, aus Natal: Van Reenen, Drakensberg, 1–22.i.1927, (*R. E. Turner*). In der Sammlung des British Museum (Natural History).

Eine sehr ausgezeichnete und leicht kenntliche neue Art, welche unter den Arten der Gattung *Zonitodema* Pér. nur allein mit *Z. nigripennis* Pic verwandt ist. Diese letztere Art besitzt aber schwarze Beine, spärlich punktierten und glänzenden Halsschild, viel längeren Lobus maxillaris und ausserdem deutlich kürzeres 1. Hintertarsenglied.

Ich benenne die Art zu Ehren von Fraulein Christine M.F. von Hayek in British Museum (Natural History).

Zonitodema erythraea Pic ab. **flaviceps** ab. nov.

Sie unterscheidet sich von der Stammform durch die abweichende Färbung des Kopfes. Bei ab. *flaviceps* ab. nov. ist der Kopf oben dunkel braunrot, unten dunkelbraun. Clypeus und die Ränder der Augen erloschen dunkler. Die Stammform besitzt einfärbig schwarzen Kopf, nur die Mundteile sind gelb.

Ein Exemplar (Monotypus, ♀), aus Abessinien (Raffray), in der Sammlung des Ungarischen Naturwissenschaftlichen Museums.

Zonitodema bimaculatithorax sp. n.

Kopf glänzend schwarz, Halsschild rotgelb, in der hinteren Hälfte mit je einem sehr grossen, in der Mittellinie nur durch einen braunen Streifen geteilten schwarzen Flecken, Schildchen ebenfalls schwarz, Flügeldecken metallisch blau, Beine und Fühler, sowie die Mundteile und die Unterseite schwarzbraun, das Ende des 4.Abdominalsegment und die übrigen bis zum Ende aber gelbrot. *Kopf* ziemlich schmal, die Schläfen hinter den Augen breit abgerundet und nicht breiter als an den ziemlich gewölbten Augen, Stirn vorne flach, hinten in Quer- und auch in Längsrichtung leicht gewölbt. Grob, aber sehr spärlich punktiert. *Fühler* lang und dünn, die Mitte des Körpers fast erreichend, das 2. Glied deutlich kürzer als das 3., die Glieder vom 4. an ziemlich gleichförmig, kaum merklich kürzer werdend, das Endglied zugespitzt. Lobus maxillaris sehr lang und dünn. *Halsschild* etwa so lang wie breit, in der Mitte am breitesten, Seiten nach vorn kaum mehr gerundet verengt als nach hinten. In Querrichtung einfach gewölbt, die Mittellinie nur angedeutet, kaum eingedrückt. Oberseite äusserst spärlich und auch fein punktiert, nur der Seitenrand etwas gröber, was aber von oben nicht zu sehen ist. *Flügeldecken* sehr grob und dicht punktiert, anliegend dunkel behaart, die Zwischenräume zwischen den Punkten bilden schwache Querrunzeln. *Unterseite* sehr fein und anliegend, gelb behaart, äusserst fein punktiert, stark glänzend. *Beine* ohne besondere Kennzeichen.

Länge: 5 mm. *Breite:* 1,6 mm.

Ein ♂ (Monotypus) aus Tanganyika Territory: Ukamba, Makueni, in der Sammlung des Ungarischen Naturwissenschaftlichen Museums.

Diese Art steht *Z. notatithorax* Pic nahe, welche ebenfalls schwarz geflecktes Halsschild besitzt, aber die Skulptur und Form des Vorderkörpers sind vollkommen abweichend. *Z. notatithorax* Pic besitzt einen breiteren, stärker gewölbten und gröber punktierten, am Grunde chagrinierten, daher fettglänzenden Halsschild, deren Mittellinie tief eingedrückt ist, wieters ist der Kopf sehr dicht und auch grob punktiert.

Zonitodema brittoni sp. n.

Kopf schwarz, Halsschild braunschwarz, Flügeldecken lebhaft metallisch blau, Beine und Fühler, sowie die Mundteile und Unterseite braun oder braunschwarz, die beiden letzten Abdominalsegmente rotgelb. *Kopf* quer, mit gewölbten, fein fazettierten Augen, Schläfen

ziemlich parallel, bis zu den abgerundeten Hinterecken etwa so lang wie der Querdurchmesser eines Auges, Stirn sehr breit und grob punktiert, die Punkte sitzen aber nur vorne und neben den Augeninnenrand dichter, Schläfen und besonders aber die Mittellinie nur vereinzelt punktiert. Der Grund ist dazwischen glatt und glänzend. *Fühler* lang und dünn, das 2. Glied kaum etwas kürzer als das 3., das 3. Glied das längste, dann werden die Glieder allmählich kaum merklich kürzer, das Endglied lang zugespitzt. Lobus maxillaris äusserst dünn und lang, so lang wie die Fühler ohne die drei letzten Glieder, der behaarte, zungenartige Teil des Lobus maxillaris mehr als doppelt so lang wie die Palpen. *Halsschild* ziemlich kugelig, in der Mitte am breitesten, nach vorne stark verengt, an der grössten Breite kaum breiter als der Kopf, äusserst spärlich und fein punktiert. *Flügeldecken* grob und erloschen, in Querrichtung schwach gerunzelt, punktiert, anliegend fein und braun behaart. *Unterseite* fein und anliegend, bräunlich behaart, äusserst fein skulptiert, glänzend. *Beine* dünn, Hinterschenkel aber ziemlich dick, Tarsen sämtlicher Beine länger als die Schienen.

Länge : 6 bis 7 mm. *Breite :* 1,8 bis 2 mm.

Vierzehn Exemplare (Holo- und Paratypen) aus Belgisch Kongo : 18 miles SW von Elisabethville, 1927–28, (*Dr. H. S. Evans*) in der Sammlung des British Museum (Natural History), weiters 1 Exemplar (Paratypus) aus Lualaba, Lubudi, 1947, (*R. Clair*) in der Sammlung des Belgischen Kongo-Museums.

Nächst verwandte Arten sind *Z. nigricollis* Beauregard und *Z. nigrithorax* Pic. Von der letzteren Art unterscheidet sie sich aber in erster Linie durch das beim Männchen nicht einfärbig gelbrote Abdomen, sowie durch die feinere Skulptur der Oberseite. *Z. nigricollis* besitzt ähnliche Färbung, aber die Mundteile sind anders gebildet, die Zunge des Lobus maxillaris ist um die Hälfte kürzer, ausserdem ist die Skulptur des Kopfes und Halsschildes ebenfalls abweichend.

Zu Ehren meines Kollegen E. B. Britton im British Museum (Natural History) in London benannt.

A SYNONYMIC REVISION OF THE GENUS *ARCYOPHORA* GUENÉE (AGROTIDAE, WESTERMANNIINAE).

By D. S. Fletcher, F.R.E.S.

WITH OBSERVATIONS ON ADULT FEEDING HABITS.

By E. T. M. Reid, B.Sc., F.R.E.S.

PART I.

A SYNONYMIC REVISION OF THE GENUS *ARCYOPHORA* GUENÉE.

By D. S. Fletcher, F.R.E.S.

(*Dept. of Entomology, British Museum (Natural History).*)

During the summer of 1953 three species of the Agrotid subfamily Westermanniinae, taken feeding on the lachrymal secretions of cattle in the Sudan, were sent in to the Department of Entomology for determination; they proved to be *Arcyophora longivalvis* Guenée, *Setoctena patricula* Hampson and *Gonioxestis zanderi* Felder. That such specialized feeding habits should be shared by the species of three genera seemed remarkable, and a study of the genitalia of the three species concerned confirmed previous suspicions that they were, in fact, congeneric.

With the kind help of Dr. E. M. Hering of the Zoological Museum in Berlin, who lent a number of types of species unrepresented in the British Museum, a study of nearly all the species that had been included in the genera *Arcyophora*, *Setoctena* and *Gonioxestis* was possible; this resulted in their being regrouped into two closely related sections of the genus *Arcyophora*. The characters of wingshape and abdominal cresting, by which the three genera were previously separated, appear to have no generic significance.

The two sections of *Arcyophora* may be separated by wingspan and the structure of the male genitalia; the female genitalia, whilst affording good specific characters, show no such sectional differences. In the typical section of *Arcyophora* the wingspan ranges from 30–54 mm. and the male genitalia bear a stout, inwardly pointing spine at the apex of the valve; in the section *Setoctena* the wingspan ranges from 20–26 mm. and the apex of the valve bears no such spine. The neuration and the structure of the legs, palpi and antennae of both sections appear to be identical; these latter characters are figured by Hampson.

As the genus appears likely to be of some economic interest, a key to the species has been devised; it is hoped that this, together with a revised syno-

nymic list of the included species with the original references cited and known distribution listed, may be of some assistance to future workers in this field.

Key to the Species of the genus *Arcyophora* Guenée.

1 Wingspan 30–54 mm.; valve of male genitalia with a stout apical spine . . . . . 2 (Sect. **Arcyophora**)
Wingspan 20–26 mm.; valve of male genitalia without apical spine . . . . . 8 (Sect. **Setoctena**)

2 (1) Hind tibiae spined, especially between the two pairs of spurs . . 3
Hind tibiae not spined 5

3 (2) Distal margin of fore wing evenly curved 4
Distal margin of fore wing angled at vein *M*3 . . . **zanderi** Felder

4 (3) Wingspan 46–53 mm.; antemedial fascia of fore wing often sinuous in cell area; male genitalia with process arising from centre of valve; female genitalia with bursa copulatrix twice as long as broad . . . . . **elegantula** Grünberg
Wingspan 34–46 mm.; antemedial fascia of fore wing never sinuous; male genitalia without process on valve; female genitalia with bursa copulatrix three times as long as broad **patricula** Hampson

5 (2) Postmedial fascia of fore wing arising from apex; not angled . 6
Postmedial fascia of fore wing arising from two-thirds of costa and acutely angled between veins *R*5 and *M*1 7

6 (5) Distribution: Punjab; male genitalia with process arising from centre of valve . . . . . **trigramma** Hampson
Distribution: Equatorial Africa; male genitalia without process on valve . . . . . **dives** Butler

7 (5) Distribution: India; male genitalia with uncus one and a half times as long as broad; in female genitalia the signum is at the centre of the bursa copulatrix . . . . . **icterica** Swinhoe
Distribution: Aden and Africa; male genitalia with uncus five times as long as broad; in female genitalia the signum is at the posterior quarter of the bursa copulatrix . . **longivalvis** Guenée

8 (1) Distribution: Asia Minor and Oriental Region 9
Distribution: Africa 10

9 (8) Fore wing with the postmedial fascia right-angled between veins *R*5 and *M*1; antemedial fascia straight from mid-costa to lower medial vein, then obtusely angled to inner margin . **dentula** Lederer
Fore wing with postmedial fascia broadly curved round discocellulars; antemedial fascia straight from two-fifths of costa to two-fifths of inner margin . . . . . **bothrophora** Hampson

10 (8) Postmedial fascia on fore wing curved from apex to inner margin **endoglauca** Hampson
Postmedial fascia on fore wing arising from two-thirds of costa and angled between veins *R*5 and *M*1 11

11 (10) Fore wing with the medial area concolorous with the remainder of the wing 12
Fore wing with the medial area suffused with cinnamon and vinaceous . . . . . **stalii** Wallengren

12 (11) Fore wing with the angle in the postmedial fascia between veins *R*5 and *M*1 connected to the apex by a streak . **piperitella** Strand
Fore wing without such a streak . . . . . **ledereri** Wallengren

A Revised Synonymic List of the Species.

Arcyophora Guenée, 1852, *Hist. nat. Ins., Spec. gén. Lép.* **6** : 378.
Type species : *Arcyophora longivalvis* Guenée.
Setoctena Wallengren, 1863, *Wien. ent. Mschr.* **7** : 144.
Type species : *Setoctena ledereri* Wallengren.
Euxestis Lederer, 1869, *Horae Soc. ent. ross.* **6** : 88.
Type species : *Euxestis dentula* Lederer.
Pseudocalpe Hampson, 1894, *Moths of India* **2** : 566.
Type species : *Euxestis dentula* Lederer.
Metaculasta Butler, 1898, *Proc. zool. Soc. Lond.* **1898** : 444.
Type species : *Metaculasta dives* Butler.
Gonioxestis Hampson, 1912, *Cat. Lep. Phalaenae B.M.* **11** : 637.
Type species : *Arcyophora zanderi* Felder.
Arcyosphora Bryk, 1913, *Int. ent. Ztg.* **7** : 213. (err. pro *Arcyophora*).
Gonioxestris Neave, 1939, *Nomenclator Zoologicus* **2** : 502. (err. pro *Gonioxestis*).

zanderi Felder, 1875, *Reise Novara* **2** (2), pl. 111 : 15, *Arcyophora.*
Abyssinia to Tanganyika ; Uganda ; Upper Guinea ; Senegal.

elegantula Grünberg, 1910, *Denkschr. med.-naturw. Ges. Jena* **16** (1) : 128, pl. 3 : 9, *Arcyophora.*
Nyasaland ; Bechuanaland ; Angola.

patricula Hampson, 1902, *Ann. S. Afr. Mus.* **2** : 314, *Maurilia.*
riggenbachi Bryk, 1913, *Int. ent. Ztg.* **7** : 217, *Setoctena.* **Syn. n.**
patriculella Strand, 1917, *Arch. Naturgesch.* **82** (A1) : 93, *Setoctena.*
S. and S.E. Arabia ; Abyssinia to Transvaal ; Congo ; Gold Coast ; Nigeria.

longivalvis Guenée, 1852, *Hist. nat. Ins., Spec. gén. Lép.* **6** : 379, pl. 12 : 9, *Arcyophora.*
lobidorsis Zeller, 1863, *Stettin. ent. Ztg.* **24** : 139, pl. 2 : 2, *Chloëphora.*
apicalis Walker, 1865, *List. Lep. Ins. B.M.* **33** : 848, ? *Calpe.*
clathrimaculata Strand, 1909, *Arch. Naturgesch.* **75** (1) : 380, *Arcyophora.* **Syn. n.**
somnambula Bryk, 1913, *Int. ent. Ztg.* **7** : 217, *Arcyophora.* **Syn. n.**
albipupillata Strand, 1917, *Arch. Naturgesch.* **82** (A1) : 92, *Arcyophora.*
verticalis Berio, 1944, *Mem. Soc. ent. ital.* **23** : 78, *Arcyophora.* **Syn. n.**
Aden ; Sudan to Natal ; Bechuanaland ; S.W. Africa.

icterica Swinhoe, 1886, *Proc. zool. Soc. Lond.* **1886** : 439, pl. 40 : 8, *Dabarita.*
bifasciata Hampson, 1891, *Ill. Het. B.M.* **8** : 61, pl. 141 : 11, *Calpe.*
Punjab ; Bombay ; Madras.

trigramma Hampson, 1912, *Cat. Lep. Phalaenae B.M.* **11** : 651, pl. 191 : 12, *Setoctena.*
N.W. India, Rajputana.

dives Butler, 1898, *Proc. zool. Soc. Lond.* **1898** : 444, *Metaculasta.*
Kenya ; Senegal.

Section *Setoctena*.

endoglauca Hampson, 1910, *Proc. zool. Soc. Lond.* **1910** : 414, pl. 36 : 20, *Metaculasta*.
Nyasaland ; N. Rhodesia ; Transvaal ; Angola ; Gold Coast.

stalii Wallengren, 1863, *Wien. ent. Mschr.* **7** : 144, *Setoctena*.
Bechuanaland.

dentula Lederer, 1869, *Horae Soc. ent. ross.* **6** : 89, pl. 5 : 8, *Euxestis*.
angulifera Moore, 1881, *Proc. zool. Soc. Lond.* **1881** : 373, *Bankia*.
innubila Swinhoe, 1886, *Proc. zool. Soc. Lond.* **1886** : 447, *Antophila*.
Syria ; Persia ; W. Turkestan ; Punjab ; Bombay.

bothrophora Hampson, 1907, *J. Bombay nat. Hist. Soc.* **17** : 656, *Arcyophora*.
Punjab ; Ceylon.

piperitella Strand, 1909, *Arch. Naturgesch.* **75** (1) : 380, *Arcyophora*.
carniola Hampson, 1912, *Cat. Lep. Phalaenae B.M.* **11** : 643, pl. 191 : 8, *Arcyophora*.
Nyasaland ; Rhodesia.

ledereri Wallengren, 1863, *Wien. ent. Mschr.* **7** : 144, *Setoctena*.
S.W. Africa, Swakop R.

References.

Hampson, G. F., 1912, *Cat. Lep. Phalaenae B.M.* **11** : 637, 642, 650.
Warren, W., 1913, *in* Seitz, *Gross-schmett. Erde* **3** : 300.
Gaede, M., 1935, *in* Seitz, *Gross-schmett. Erde* **15** : 204.
Draudt, M., 1937, *in* Seitz, *Gross-schmett. Erde* **3**, Suppl. : 265.
Gaede, M., 1938, *in* Seitz, *Gross-schmett. Erde* **11** : 450.

PART II.

OBSERVATIONS ON FEEDING HABITS OF ADULT *ARCYOPHORA*.

By E. T. M. Reid, B.Sc., F.R.E.S.

(*Veterinary Entomologist, Sudan Government.*)

Mr. T. W. Chorley has very generously encouraged me to continue with some observations that he had made on a moth which fed at the eyes of cattle. We found the moths feeding on the lachrymal secretions of cattle in the Southern Sudan and sent them to Mr. D. S. Fletcher at the British Museum (Natural History). He very kindly identified them and searched the literature for all previous records of their feeding habits. Beyond some accurate observations by Mr. W. F. Poulton in Tanganyika, very little is known. There is a possibility that these moths will eventually be found to be of economic importance and we are publishing these preliminary observations made in the Sudan in the hope that further observations will be made in other parts of Africa.

Previous observations summarised.

Arcyophora elegantula Grünberg.

This species is recorded from the carcase of a dead bullock in Nyasaland.

Arcyophora longivalvis Guenée.

There are a number of observations on this species, which appears to be very widely distributed.

(i) Tanganyika, Rukuba Hill, 4,000 ft., 1915. Mr. W. F. Poulton, a veterinary officer, whilst treating mules for horse sickness noticed moths round their eyes at night and made the following accurate observations.

" They would alight on the animal's head, either in close proximity to the eye or nose; from the latter they would make their way straight to the eye, elongate the proboscis and feed on the secretion which collects under the lid. The proboscis would also wander over the cornea, making the animal blink several times and cause increased lachrymal secretion."

He noted also that there was no preference for a sick animal over a healthy one, and that the moths settled only on the head and not on other parts of the body or the rugs. These observations were communicated by Sir Guy Marshall to the Entomological Society and a discussion was held as to the possibility of its being responsible for the transmission of African horse sickness.

(ii) Brain (1929) reports it as visiting the eyes of cattle in South Africa and regards it as being a likely transmitter of forms of ophthalmia. There are also records in the files of the Southern Rhodesian Government Laboratories, and R. W. Jack considers it as a possible vector of forms of ophthalmia in cattle.

Arcyophora patricula Hampson.

Mr. D. J. Lewis records having taken one sucking fluid from a horse's eye at Heiban (30° 30′ E., 11° 10′ N.) in the Nuba Mountains and also two others from near the horse's eye.

Mr. T. W. Chorley took specimens of this species from the eyes of cattle in Uganda in 1939 or 1940. He had been experimenting on the attraction of *Glossina pallidipes* Austen (Diptera) to cattle at night. No moths were observed until a minute or two after a herd of buffalo had been accidently stampeded near-by. Numerous moths were then seen to be clustering round the eyes of the bait animal, the inference being that the moths had been previously feeding on the buffalo and had come to the bait animal because the former had stampeded.

Dr. T. H. C. Taylor, formerly of the Commonwealth Institute of Entomology, records a Noctuid from the eyes of cattle in Uganda (possibly the same record as above).

Dr. S. A. Neave (1915) in a discussion at a meeting of the Entomological Society said that he had once found many moths sucking fluid (not blood) from a wounded animal in South Africa. They were possibly species of *Arcyophora*.

Feeding Habits.

Larval Feeding Habits.

Very little is known of the larval food plants of the species in this genus. *A. dentula* Lederer is recorded by Mukerjee (1941) as having almost defoliated pomegranates at New Delhi. He described the larvae as being uniformly light green, sparsely studded with long hyaline hairs. The cocoon is silken, white and conical, reinforced by particles of the soil in which it pupates.

Fully fed larvae of *A. longivalvis* Guenée have been noted by E. E. Platt (1921) in Natal on *Combretum gueinzii* Sond. in May and November.

The adults which have been taken are all from well wooded country characterized by the presence of *Terminalia* and *Combretum*.

Adult Feeding Habits.

The moths are nocturnal and are first found from about one hour after sunset until at least 10 p.m., when I used to leave them. I have been completely unsuccessful in searching for them in the daytime near the cattle pen at which we could catch many in an evening.

Table I shows the records so far available of the feeding habits of the adults. When there were cattle, donkeys and a horse in close proximity to each other, *A. longivalvis* appeared to be more attracted to the horse than to the other animals. In the absence of ponies it came readily to cattle and could be taken without difficulty. It did not appear to be as common in Wau in June, 1953, as either of the other species, of which *A. patricula* was the most plentiful. Other than this slight variation, there were no readily distinguishable differences in the habits of the three species observed in the Sudan, namely *A. patricula*, *longivalvis* and *zanderi*.

Table I.—*Showing animals from which adult* Arcyophora *were taken.*

A. patricula.	*A. longivalvis.*	*A. zanderi.*	Date.	Host.	Locality.	Remarks.
4 ♂, 1 ♀	—	2 ♂	v.53	Cattle	Malek	6° 43′ N.29° 45′ E.
13 specimens	—	2 specimens	vi.53	,,	Wau	7° 40′ N.28° E.
Many	1 specimen	Many	vi.53	,,	Wau	Records for the same evening on animals near each other.
2 specimens	6 specimens	1 specimen	vi.53	Horse	,,	
2 specimens	1 specimen	4 specimens	vi.53	Donkeys	,,	
Many	1 specimen	Few	vi.53	Cattle	,,	—
Present	—	Present	vi.53	,,	Aweil	8° 50′ N.27° 20′ E.
Present	Present	,,	viii.53	,,	Wau	More *patricula* than of other two species.
3 specimens	—	—	vi.41	Horse	Heiban	D. J. Lewis.
Present	—	—	—	Cattle	Uganda	T. W. Chorley. T. H. C. Taylor.
—	Many	—	1915	Mules	Tanganyika	W. F. Poulton.
Present	—	—	—	Horse	—	Previous record noted by W. H. T. Tams.
—	Many	—	Various	Cattle	S. Africa	—
Species unknown			1915	Wounded Buck	,,	S. A. Neave.
A. elegantula			1915	Dead Bullock	Nyasaland	S. A. Neave.

The moth flies directly to the animal and alights on the lower part of the face. If the animal is moving the moth flies after it. It remains for a few seconds and then crawls rapidly upwards. It may pause and probe at any drying secretions which have run down the face, but inevitably crawls up as far as the eye, where it remains. During the quick scuttling movement the moth begins to quiver, especially as it nears the eye. It may remain near the eye, quivering for a few seconds, and then it extrudes its proboscis to a length of about 1 cm. It probes all over the cornea, under the lids and into the corner of the eye, the proboscis being moved rapidly to and fro. It usually inclines its body to probe more easily under the eye lids. The quivering of the body continues until a suitable source of liquid is found, then it settles down to feed. During the probing, the proboscis can be seen to pulsate regularly, and this continues while the animal is feeding.

The probing must irritate the eye considerably as the host animal blinks frequently and there is a greatly increased lachrymal secretion. Sometimes the moth is dislodged by the blinking; or again it may be unable to get sufficient liquid from one point; in these cases it then moves rapidly round the eye to another vantage point and immediately continues its probing.

A single specimen of *A. zanderi* was observed for over four minutes. It had settled on the head of an animal before we arrived and was imbibing fluid from the inside corner of the eye. It would occasionally move its proboscis and probe over the cornea, doubtless to increase the flow of tears and would then return to the corner of the eye. During the first two minutes of observation nothing unusual was noticed, except that drops of fluid fell at short intervals; these were then seen to be clear drops of anal exudate. Once this was realised, closer attention was paid, and a total of 19 drops were counted at intervals of approximately five seconds. The fluid would be exuded slowly until a drop of about 1 mm. in diameter was formed at the terminal segment of the abdomen. This would then fall and another immediately begin forming. The moth eventually became restless and it was captured.

Attempts to feed moths on captive animals by means of gauze cages placed over the beasts' heads were unsuccessful. The calf (adult cattle were too untractable) was extremely restless and the moths refused to feed. They were eventually induced to feed in small numbers by ensuring that they could move freely up to the eye, otherwise they would fly to the top of the cage and remain there. Once a moth had been induced to feed, it would continue to do so, flying straight to the eye from any position. A far simpler and more effective way would be to keep a bait animal in a gauzed stable and allow the moths to fly about at will.

A single moth was kept for four days in a tube; it was then given a little moistened cotton wool. It began to quiver immediately and began probing the cotton wool. An even more effective way to provoke the probing reaction was to moisten the cotton wool with saliva or diluted lachrymal secretion.

Other Observations.

The moths are strongly phototrophic until they have really settled down to feeding, when a strong torch light does not appear to worry them. If they are disturbed they fly away from the light and upwards at slightly more than a fast walking pace.

Poulton (1915) did not notice any special preference for sick animals over healthy ones. I have noticed a preference for animals with an increased lachrymal flow as compared with those with normal eyes. Cattle suffering from watery eyes during rinderpest are much favoured. One old cow was more attractive to the moths than any other animal in a herd of 30 animals, though she had normal eyes.

Discussion.

The *Arcyophora* adults so far observed live entirely on the secretions of animals, with a decided preference for those from the eye. Owing to their habit of feeding at and irritating the eye, they have been discussed as being possible vectors of some forms of ophthalmia. They are peculiarly suited to be indicted, but insufficient is yet known about them and their relation to cases of ophthalmia amongst domestic stock. Chorley's observation in Uganda makes it seem probable that in the wild state they feed on game. In view of this the possibility of their being mechanical vectors of those virus diseases which are carried from game to cattle and amongst cattle in the secretions and excretions of infected beasts should be borne in mind. The high intake of fluid from the eye would almost certainly contain viruses and they might possibly be transmitted either in the anal exudate or salival regurgitate.

Acknowledgments.

I am very grateful to the Director, Sudan Veterinary Services, Khartoum, for permission to publish this paper, and to Mr. D. S. Fletcher, who painstakingly searched the literature for me and obtained information from other museums and workers. I am also grateful to Mr. T. W. Chorley, M.B.E., for suggesting that I continue his observations and to Mr. Blasdale, who has helped in making some of them.

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Mukerjee, T. D., 1941, *Indian J. Ent.* **3** : 337.

THREE NEW THYSANOPTERA FROM TRINIDAD AND BRITISH GUIANA

By Prof. J. Douglas Hood, F.R.E.S.

(*Cornell University, Ithaca, N.Y.*)

The first of the three species described below was taken by Dr. C. B. Williams in Trinidad, in 1916, but, as his two specimens were defective in some respects and no urgency for giving them a name existed, their description was postponed in the hope that further material would be found. In 1951, while collecting in the Botanical Gardens in Georgetown, British Guiana, at the suggestion of Mr. L. D. Cleare, Deputy Director of Agriculture, the writer was pleased to find a third specimen, and this becomes the type of a species which, after so many years, is named after its discoverer. The two remaining species were taken in Trinidad, also in 1951, while the writer was a guest at the Imperial College of Tropical Agriculture and constantly aided and advised by Prof. C. Y. Shephard, then Acting Principal of the College, and Prof. T. W. Kirkpatrick, Entomologist.

Bradinothrips gen. n.

(ραδινός, slender ; θρίψ.)

Heliothrips group, closest to *Caliothrips* Daniel. Body more slender than usual in the group, with relatively broad head and narrow thorax and abdomen, polygonally reticulate only on occiput of head, on metanotal plates, and (to some extent) along sides of abdomen ; pronotum cross-striate with anastomosing lines which are raised laterally. Head broadest across the elongated eyes, rounded in front, with broad frontal costa, and ocelli somewhat behind middle ; mouth-cone broad, heavy, rounded at tip, labrum not attaining tip of labium. Antennae eight-segmented, very slender, segment I small, III in type species five times and VIII seven times, as long as wide ; sense-cones on III and IV forked. Fore wings nearly straight, terminating in two long, strong setae ; anterior vein fused with (or at least very close to) ambient vein, the posterior vein distinct, each with few setae ; anterior fringe comprising a longer and sparser series lying in plane of wing and a shorter, more numerous series which is inclined downward ; posterior fringe wavy. Legs slender but not long. Abdomen with segment IX longest, asperate, its setae strong but not long ; X short, not divided above ; terga I–VIII and sterna I–VII with posterior margining flange.

Type species : *Bradinothrips williamsi* sp. n.

It is scarcely possible that Jacot-Guillarmod's *Monilothrips montanus*, from Basutoland, is congeneric with *williamsi*, though the two have a number of features in common. The reticulated area on the head of *montanus* is much the same as in *williamsi*, but is bordered posteriorly by a faint, non-sculptured band which seemingly forms a bearing surface for the front margin of the pronotum ; and the fore wings of *montanus* have closely setose veins. The type species of *Monilothrips* (*kempi* Moulton, from India), unknown to both Jacot-Guillarmod and me, was described as a member of a different subfamily, the Thripinae, but, as Jacot-Guillarmod points out, *montanus* is un-

doubtedly a true heliothripine and quite possibly not congeneric with *kempi*. From *Monilothrips* as typified by *kempi*, *Bradinothrips* is clearly distinct because of the slender body, the different chaetotaxy of the head, pronotum, and wings, long eyes, more posteriorly located ocelli, slenderer antennae, and undivided terminal abdominal segment.

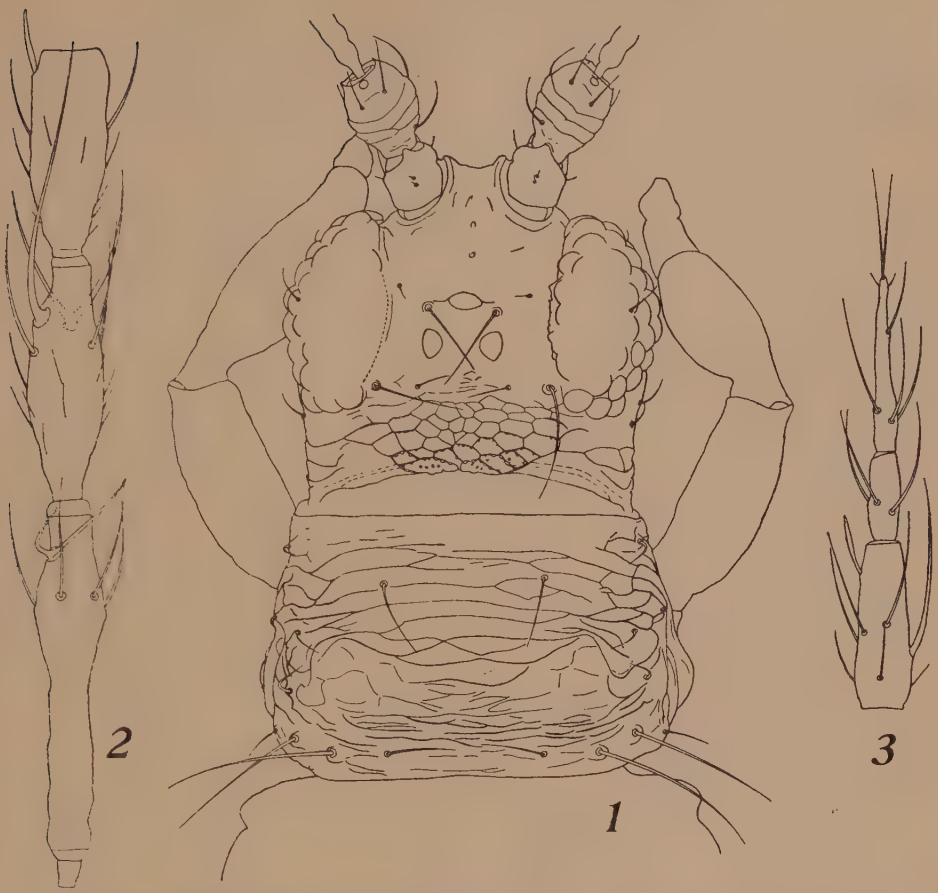
Bradinothrips williamsi sp. n.

Female (macropterous).—Length about 0·96 mm. (distended, 1·05 mm.). Colour brown, darker in apical part of abdomen, with head pale anterior to the reticulated area, and pronotum and mesonotum paler medially; legs paler than body, yellow, with brown coxae and with femora and tibiae irregularly clouded except at ends; fore wings grey-brown, with a narrow, nearly white, band beyond middle and another before tip, the dark basal part obscurely paler beyond anal area and in distal half of costal margin; hind wings pale, with a dark vein extending nearly to tip; antennae dark brown and about concolorous with body in segments I and II, yellowish-grey in V–VIII, pale yellowish in III to setae, thence darkened with grey, IV darker than III, especially apically, and with a nearly colourless, less sclerotized, subbasal cross-band; ocellar pigmentation dark orange.

Head (fig. 1) scarcely 0·9 as long as greatest width across eyes and about 1·2 times as long as pronotum, cheeks narrowed to middle and subparallel from thence to base, head slightly produced between eyes and antennae and narrowed to latter; frontal costa roundly excavated, broader than first antennal segment; sculpture (shown in figure) stronger posteriorly and laterally, the median posterior reticles with strengthening dots, the posterior submarginal apodeme interrupted medially, the area between eyes smooth, with a median row of three minute tubercles in front of anterior ocellus; interocellar setae usually 32–37μ long, arising slightly outside lines tangent to outer margins of ocelli, slender at tip and pointed, pale yellow; postoculars longer (40μ or more), similarly formed and coloured, arising between eyes on a line with the short post-ocellars; normally two pairs of short curved setae on cheeks behind eyes, and another short pair near eyes, in advance of median ocellus. Eyes long (78μ), narrow (39μ), and well separated (67μ). Antennae formed and sculptured as shown in figs. 1–3; sense-cones on III and IV forked, IV with an additional and especially long, simple one arising from outer dorsal suface; III and IV each with a pale weakened band beyond pedicel.

Prothorax (fig. 1) with sides and posterior margin slightly convex, front margin nearly straight; sculpture consisting of transverse lines which become heavier and raised laterally; two pairs of long setae at posterior angles, arising from slight tubercles and 57–64μ long; five pairs of small, curved, lateral setae; a single pair near posterior margin directly between interior pair at angles; and a longer pair well behind anterior margin and equidistant from lateral margins and each other. Mesonotum smooth medially, lightly sculptured at sides; metanotum lightly polygonally reticulate. Costal margin of fore wings with about eleven setae in upper horizontal series, these much longer and stronger than those of the lower, downwardly-inclined series of about 15 which starts at basal third of wings; tip of wing ending in two setae, one behind the other, homologous with those of the series first mentioned and, like them, arising from distinct eminences, but longer and stronger; wing with four setae in basal third, two well-spaced ones on anterior vein in apical fourth, and four on posterior vein.

Abdomen with a few dark anastomosing striae on base of tergum I, these inclining forward medially and forming irregular reticles laterally; IX across middle third with an irregular band of microtrichia arising from minute asperae; remainder of dorsum of abdomen smooth excepting for a forwardly-arched dark sub-basal line on each of terga III–VIII and a slight reticulation at sides; setae on IX and X strong at base, tapering rapidly to sharp points, I on IX 58μ, II 83, III 69, another similar pair arising anterior to II; X not divided above, setae I and II each about 64μ.



FIGS. 1–3.—*Bradinothrips williamsi*, gen. et. sp. n.; ♀, holotype. (1) Head and prothorax, × 242 (details of fore legs not shown). (2) Segments III–V, left antenna, × 484. (3) Segments VI–VIII, left antenna, × 484.

Measurements of ♀ (holotype), in mm.: Length about 0·96 (distended, 1·05); head, length 0·123, width across eyes 0·145, greatest width across cheeks 0·134, least width across cheeks 0·124; median ocellus, diameter 0·011; posterior ocelli, diameter 0·012, interval 0·014, distance from median ocellus 0·012; postocular setae, length 0·040, interval 0·067; mouth-cone, length beyond posterior dorsal margin of head 0·087; prothorax, median length of pronotum 0·101, width (exclusive of coxae) 0·153; mesothorax, width across anterior angles 0·175; metathorax, greatest width posteriorly 0·167; fore wings, length 0·654; abdomen, greatest width (at segment 4) 0·214.

	Antennal segments.							
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Length (μ) . . .	20	37	74	46	41	33	17	36
Width (μ) . . .	23	27	14	15	15	13	7	5

Total length of antenna, 0·304 mm.

1 ♀ holotype, on grass in Botanical Gardens, British Guiana: Georgetown, 30.vi.51 (*J. D. H.*).

2 ♀ paratypes, swept from grass, Trinidad: St. Clair, 1.v.16 (*Dr. C. B. Williams*).

Pygothrips mamillicauda sp. n.

Female (macropterous).—Length about 1·0 mm. (distended, 1·2 mm.). Colour blackish brown, shading to black in last abdominal segment, the pterothorax and base of abdomen palest; legs about concolorous with body, femora somewhat lighter than tibiae and tarsi, and tipped with brownish-yellow; fore wings grey-brown, darker in basal third (including anal area) and somewhat darker apically, with a pale median streak in middle third; antennae with segments I and II yellow and paler than the others, I lightly shaded with grey, III yellow in narrow basal portion, remainder of antennae blackish-brown and concolorous with tibiae; scattered internal pigmentation crimson-red.

Head (fig. 4) about as wide as total length, very slightly broader across cheeks than across eyes, not produced between eyes and antennae, cheeks gently rounded and converging nearly to base; surface smooth and shining, without sculpture excepting for two or three faint striae in basal collar; postocular setae dark brown, short (37μ), sharply pointed, about 117μ apart and only 2μ from eyes; ocellar, postocellar, and occipital setae minute. Eyes with three enlarged facets at outer angles, about 63μ long dorsally, 40μ wide, and 59μ apart. Mouth-cone 102μ long, about attaining posterior margin of prothorax, tapering to its broadly rounded apex. Antennae (fig. 5) seven-segmented, the morphological seventh and eighth segments firmly united and with separating suture visible only on ventral surface; segment III narrower than either of the adjoining segments, II longer than any excepting VII + VIII; segment III with a major sense-cone on outer surface (one antenna with an additional ventral sense-cone on III), major sense-cones on IV–VI as follows on inner (and outer) surfaces: IV 2(1), V 1(1), VI 1(0).

Prothorax (fig. 4) short, medially about one-half the length of head, its anterior margin deeply concave; epimeral seta dark brown, pointed, about 50μ long; other setae shorter, the antero-marginals, antero-angulars, and midlaterals minute, the postero-marginals 22μ, coxals 30μ; pronotum smooth and shining, without median apodeme, but with a few faint straiae along posterior margin. Mesonotum and metanotum almost smooth, the former with a few faint anastomosing cross-striae, the latter with a few very faint reticles at sides, near base. Legs normal; fore tarsi with a strong tooth on inner surface. Fore wings without accessory setae.

Abdomen normal; sterna III–VII longer than their terga, their anterior margins arched forward; tergum II without pores; tube (fig. 6) longer than wide, slightly narrowed basally, mammiform apically, with toothed longitudinal ridges, each tooth bearing a short, stout, posteriorly-directed seta; size and form of setae on segments VIII and IX, and the terminal setae, shown in figure, IX with I 165μ, II 167μ, III 113μ.

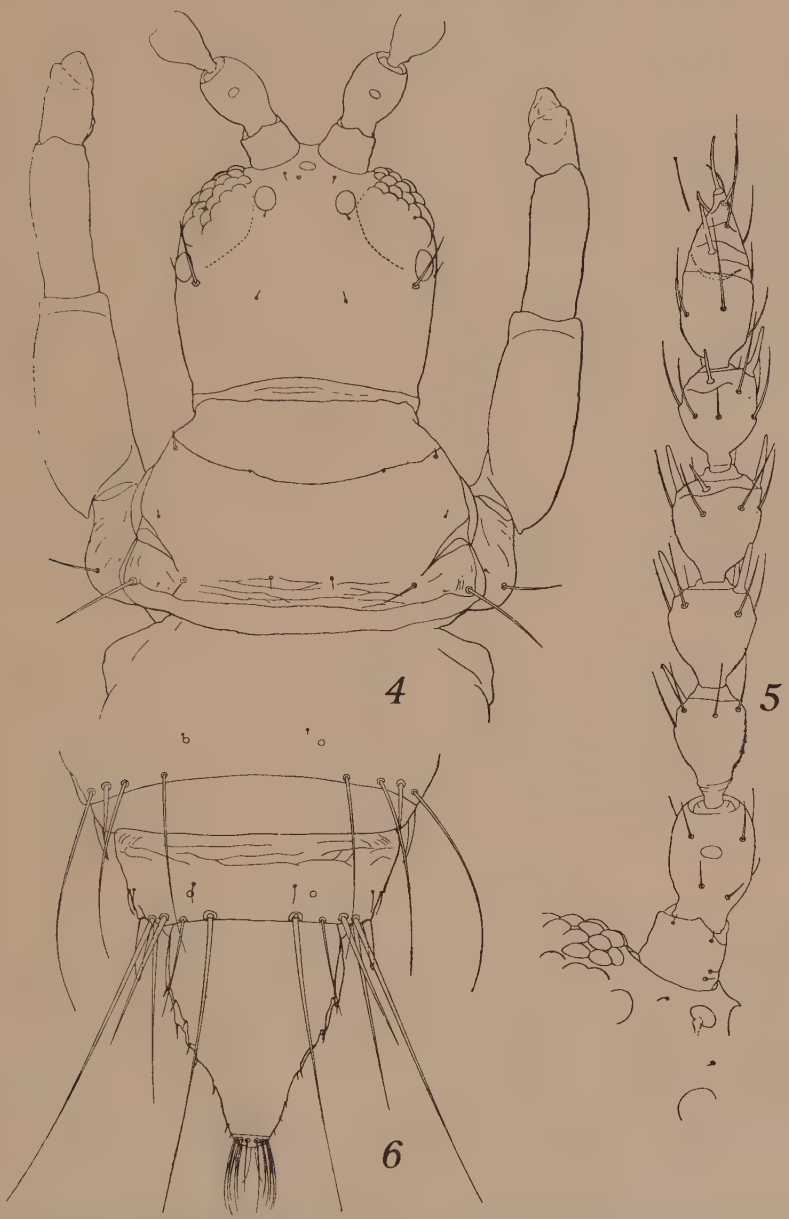
Measurements of ♀ (holotype), in mm.: Length about 1·0; head, total length 0·137, width across eyes 0·139, greatest width across cheeks 0·140, width near base 0·120; prothorax, median length of pronotum 0·067, width (inclusive of coxae) 0·230; mesothorax, width across anterior angles 0·210; metathorax, greatest width posteriorly 0·211; fore wings, length 0·547; abdomen, greatest width (at segment V) 0·266; tube, length 0·119, greatest subbasal width 0·097, least apical width 0·018; terminal setae, length 0·039.

	Antennal segments.						
	I.	II.	III.	IV.	V.	VI.	VII+VIII.
Length (μ) . . .	30	45	37	36	36	36	60
Width (μ) . . .	28	30	26	30	30	27	24

Total length of antenna, 0·280 mm.

1 ♀ (holotype), TRINIDAD : St. Joseph, 26.vi.51 (*J. D. H.*), from vines and other vegetation.

This small species resembles *conifer* in having the last two antennal segments forming a compact mass, the head short, the postocellar setae minute, the



FIGS. 4–6.—*Pygothrips mamillicauda*, sp. n.; ♀, holotype. (4) Head and prothorax, × 196 (sculpture and chaetotaxy of legs and antennae not shown). (5) Left antenna, × 311. (6) Tip of abdomen, × 196 (sculpture of terminal segment not shown).

second abdominal tergum without a pair of pores, the metanotum smooth, and also in the coloration of the fore femora ; but the black (instead of orange) tube, and its form, serve to separate them readily.

Æsthetothrips gen. n.

(*αἰσθησις*, perceptive ; *θρίψ*, in allusion to the numerous antennal sensoria.)

Allied to *Hoplothrips* and *Eurythrips*. Head much longer than wide, only slightly produced between eyes and antennae, incised behind eyes, vertex not produced and not overhanging, sculpture not strong, postocular setae very widely separated, nearly lateral in position, head without other major setae ; eyes not large, rounded, finely facetted, and without specially differentiated facets ; ocelli large ; mouth-cone short, its sides sub-parallel basally, its tip semicircularly rounded, tip of labrum not attaining that of labium, both pairs of palpi very short ; antennae with eight separate segments, the fourth and fifth segments enlarged and with numerous short sense-cones (at least in the macropterous form), the usual sense-cones long and slender. Prothorax moderately heavy, pronotum with concentric fore and hind margins and the usual complement of setae, lightly and rather sparsely sculptured, without median apodeme. Pterothorax longer than wide, with straight, posteriorly-converging sides and broadly rounded anterior angles. Legs short, fore femora somewhat swollen, fore tarsi with a short, sharp, recurved tooth. Fore wings straight and relatively narrow, with a short median vein terminating beyond middle, without accessory setae on hind margin. Abdomen not broader than pterothorax, relatively long, and with a long, slender, thickened tube ; median tergite of tergum I long, narrow (excepting for the slender, laterally prolonged posterior portion), and with two pores ; terga II–VII (in the macropterous form) each with two pairs of wing-retaining setae of which the anterior pair is smaller and straighter.

Type species : *Æsthetothrips tucuche* sp. n.

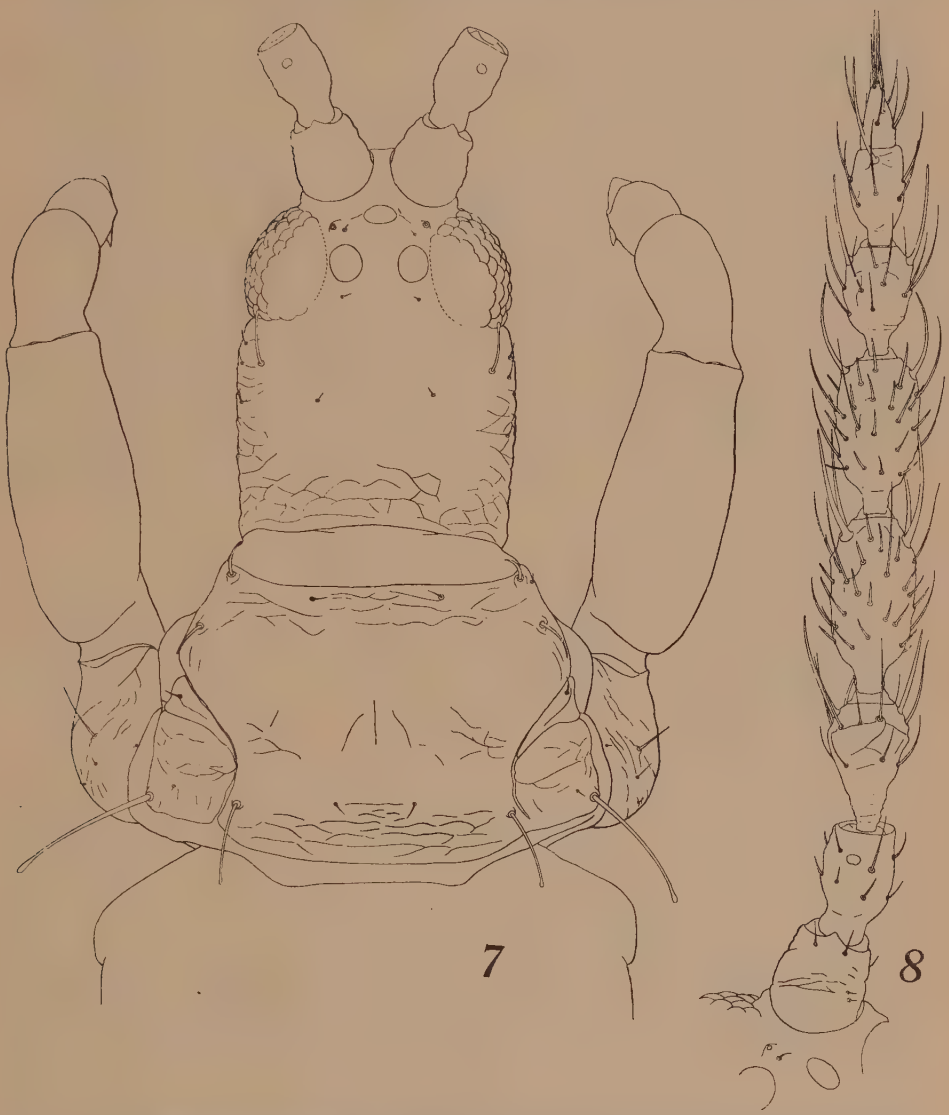
The enlargement of the two segments lying in the middle of the antennae, and their evolvement of numerous short sense-cones, are suggestive of two or three of the species of the genus *Hoplothrips*, such as *H. semicaecus* and *H. amabilis*, and are characters which seem to have arisen independently elsewhere in the phlaeothripid series. But the species upon which the present genus is based is doubtless closer to *Eurythrips* and its allies.

Æsthetothrips tucuche sp. n.

Female (macropterous).—Length about 1·8 mm. (distended, about 2·3 mm.). Colour yellowish-brown, head darkest and heavily shaded along sides, abdomen darker apically, palest in median portions of segments II–IV, most of the segments shaded posteriorly, IX darkened at sides posteriorly, X nearly uniform rich brown ; coxae brown, remainder of legs brownish-yellow and paler, with femora and tibiae lightly clouded except at ends ; fore wings nearly uniform light brown, with a narrow dark vein just basal to middle third, slightly paler in front of vein nearly to margin of wing, and with an obscure light streak paralleling posterior margin beyond middle ; hind wings light brown, with the dark vein extending nearly to tip of wing, the area behind this vein darkened, a narrow streak in front of it pale ; antennae concolorous with head in segment I, II yellowish but darkened in pedicel and laterally, III yellow in about basal third and gradually darkened to light brown apically, IV–VIII blackish-brown, paler in pedicels, IV paler than the others.

Head (fig. 7) nearly 1·4 times as long as greatest width (which is across cheeks), much longer than pronotum, notched behind eyes, produced about 7μ between eyes and antennae, lightly reticulate across base and along sides, cheeks sub-parallel, gradually rounded to

eyes and base; vertex scarcely produced or overhanging, rounded (rather than conical) in front; dorsum with one pair of major setae, only, the postoculars, these pale, curved, rounded at tip, 38μ long, 125μ apart, and arising close to sides of head, 17μ behind posterior margin of eyes. Eyes rounded, finely facetted, without enlarged facets posteriorly, their dorsal length 70μ, width 44μ, interval 59μ. Ocelli large, 17–20μ in diameter, the median one 16μ from posterior ones, directed forward and upward, and slightly overhanging, the posterior ocelli almost touching eyes and 20μ apart. Antennae (fig. 8) with fourth and fifth segments enlarged, the former of these much longer than any of the others and broader



FIGS. 7–8.—*Æsthetothrips tucuche*, gen. et sp. n.; ♀, holotype. (7) Head and prothorax, × 160 (sculpture and chaetotaxy of legs and antennae not shown). (8) Left antenna, × 210.

than any excepting the first, both IV and V with numerous short sense-cones whose number and distribution are shown in the figure; IV–VII with narrow, abrupt pedicels; usual major sense-cones long and slender, disposed as follows on inner (and outer) surfaces of segments: III 1(2), IV 2(2), V 1(1), VI 1(1), VII 1 dorsal.

Prothorax (fig. 7) moderately large and heavy, epimera and episterna not fused with notum, the last of these only lightly sculptured; major setae all present, pale yellowish, antero-marginals minute and pointed, the others curved and with rounded tips, antero-angulars about 33μ long, midlaterals 30μ, coxals 34μ, epimerals 79μ, postero-marginals 50μ. Pterothorax long, with nearly straight sides which slightly converge posteriorly, and with rounded anterior angles; mesonotum lightly transversely reticulate with anastomosing lines, those in anterior half minutely asperate, those along posterior margin darker and stronger; metanotum polygonally reticulate in a triangular median area extending from mesonotum to end of metanotum, this area slightly elevated in the neighbourhood of the two major (64μ) pointed setae. Fore tarsal tooth small, sharp, curved backward. Fore wings without accessory setae on posterior margin.

Abdomen slender, narrower than either the prothorax or mesothorax; median tergite of segment I somewhat capstan-shaped or hat-shaped, with sides concave, posterior margin narrowly prolonged laterally, and with two pores at base, its surface finely and somewhat concentrically polygonally reticulate; remainder of dorsal surface of abdomen lightly and almost completely reticulate (excepting in median posterior part of the segments and in all of posterior half of IX), many of these reticles (especially the lateral ones) minutely asperate; tube long and slender, equal in length to head, with distinct basal collar, its sides thence slightly diverging in basal one-tenth, then somewhat converging to end of basal fifth, its remainder tapering evenly to apical tenth, in which it is more abruptly narrowed, the width across basal collar 76μ, greatest subbasal width 72μ, least apical width 36μ, its walls thickened (9μ) from near base almost to tip; terminal setae one-half the length of tube, light brown; wing-retaining setae dark brown; other abdominal setae yellow, the major ones on I–VIII with pale rounded tips, those on IX pointed, seta I on IX 111μ, II 188μ, III 162μ.

Measurements of ♀ (holotype), in mm.: Length about 1·84 (distended, 2·26); head, total length 0·210, width across eyes 0·146, least width just behind eyes 0·137, greatest width across cheeks 0·152, width at base 0·140, length in front of postocular notch 0·094, length behind notch 0·115; mouth-cone, length beyond posterior dorsal margin of head 0·105; prothorax, median length of pronotum 0·147, width (inclusive of coxae) 0·312; mesothorax, width across anterior angles 0·290; metathorax, greatest width posteriorly 0·269; fore wings, length 0·812; abdomen, greatest width (at segment III) 0·280; tube, length 0·210; terminal setae, length 0·105.

	Antennal segments.							
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Length (μ) . . .	43	53	57	74	66	48	43	31
Width (μ) . . .	42	32	36	39	36	30	25	16

Total length of antenna, 0·415 mm.

1 ♀ (holotype), Trinidad: Mt. El Tucuche, 22.vi.51 (*J. D. H.*), from dead, hanging leaves of banana tree growing in cacao plantation.

A NOTE ON SOME AFRICAN SPECIES OF *TOXOPHORA* MEIGEN (DIPTERA : BOMBYLIIDAE).

By S. J. Paramonov.

Up to the present the following Ethiopian species of *Toxophora* Meigen are known :

(1) *Toxophora carcelii* Guérin-Méneville, 1831 (*Magasin de Zoologie* **1** (2) : 16, 1 col. pl.), from Senegal, which is omitted in catalogues of Diptera (see original description below).

(2) *T. maculipennis* Karsch, 1886.

(3) *T. trivittata* Bezzi, 1908.

(4) *T. punctipennis* Bezzi, 1924.

(5) *T. diploptera* Speiser, 1910.

(6) *T. coeruleiventris* Karsch, 1887.

(7) *T. epargyroides* Hesse, 1938 (= *epargyra* Bezzi, *non* Herm.).

(8) *T. cyanolepida* Hesse, 1938 (= *diploptera* Bezzi, *non* Speiser).

(9) *T. australis* Hesse, 1938 (= *maculata* Bezzi, *non* Rossi).

(10) *T. obliquisquamosa* Hesse, 1938.

(11) *T. crocisops* Hesse, 1938.

(12) Possibly the problematic *T. fuscipennis* Macquart, 1840, occurs in the Ethiopian Region (it is described from North Africa). This species is inadequately described, but we have the wing drawings of the type in Verrall, 1909, *British Flies* : 511, fig. 295, and Séguy, 1936, *Faune de France*, **13** : 219, figs. 221–222. Details of *T. fuscipennis* are given in my 1933 paper (*Trav. Mus. Zool. Akad. Sci. Ukr.*, **12** : 33–34, 39).

(13) *T. vitripennis* ♀, Bezzi, 1924.

Toxophora carcelii Guérin.

Guérin, 1831, *Mag. Zool.* (2) **1** : 16, and col. pl. 16. Guérin writes :

" T. nigra, thorace gibbosa, flavo circiter, mediaque parte nigro et bimaculato. Abdomen flavum, quinque fasciis nigris transversalibus ornatum, quorum duae anteriores integrae, tres posteriores media parte interruptae, alis hyalinis, pedibus antennisque nigris. Long. 5 mm., envergure 7 mm.

" Sa tête est assez petite, entièrement occupée par les yeux, qui sont noirs ; elle est garnie, à son insertion avec le corcelet, de quelques poils jaunes, les antennes et la trompe sont noires ; le corcelet est très bombé, noir, armé de long poils raides et courbés en arrière avec son contour et deux taches au milieu garnis d'un duvet jaune soufre. Le métathorax est noir, arrondi en arrière. Les ailes sont transparentes, tout-à-fait incolores. Les balanciers sont distincts, jaunes. Les pattes sont noires, armées de longs poils raides. L'abdomen est noir, composé de sept segments ; le premier, noir à sa base, et ayant trois taches formées par le duvet jaune dont il a été parlé ; le second et troisième ayant chacun une bande transverse jaune non interrompue, qui forme à peu près la moitié de leur largeur, enfin les quatre autres étant presque entièrement occupées par le jaune qui règne au milieu et interrompt les bandes noires. Le dessous de l'abdomen est garni presque entièrement d'un duvet jaune pâle.

" Du Sénégal : communiquée par M. Buquet, marchand d'objets d'histoire naturelle."

Toxophora coeruleiventris Karsch.

1♂, 28–29.viii.1931, Uvira, Tanganyika T. (*J. Ogilvie*).

In my previous papers (1933, *Trav. Mus. zool. Akad. Sci. Ukr.* **12** : 33–46, etc.) I have shown that the chaetotaxy in this genus plays a very important part in identification.

In this species there are 3 pairs of bristles along the bow-like anterior margin of the mesonotum—one lateral pair at the sides and two pairs in the middle part (median and submedian pairs). On the lateral part of mesonotum there are, in front of the base of wing : 1 bristle placed on first one-third of distance between the anterolateral angle of mesonotum and the base of wing, then a group of 4 bristles on the second third of this distance ; these 4 bristles form a cross (the first bristle of the longitudinal pair is stronger, the lower bristle of the transverse pair also stronger than its partner above) ; 1 bristle just near base of wing ; another bristle a little higher and posteriorly and finally one bristle on posterior callus. There is also a weak dorsocentral pair before the sides of scutellum. Scutellum with two marginal pairs of bristles. Metapleurae with one very strong, anteriorly directed black bristle. Pronotum (in this genus a pronotum exists) with two pairs of bristles : a central pair directed upwards and posteriorly and a lateral pair directed inwards (the apices of the bristles crossing), the propleurae with 3 pairs of upwardly and anteriorly directed bristles.

The facets at the line of contact of eyes distinctly larger than others ; very large.

Toxophora vitripennis Bezzi.

Ground-colour black ; the scales are white or black (with purplish tinge), yellowish or yellow ones quite absent. Antennae long, proportion of segments approximately : 2·75 : 1 : 1·25 ; scales black, sparse, without tufts of scales. Third segment very regularly pointed towards tip, not bristle-like on apical half. At base of antennae two small snow-white tufts of scales (only at sides !). Frons deep velvet black. Behind the ocellar triangle some pure white scales, similar small spots of white scales at sides of hind margin of eyes. Occiput with deep black scales (slightly purple) ; some white scales are present on lower part of occiput. Light hairs in central part of occiput not numerous and poorly developed. Occiput extremely convex in dorsal view, nearly as convex as eyes.

Pronotum and anterior part of mesonotum covered so densely with mixed white and blackish scales that the insertions of the broken bristles are not discernible. Remainder of mesonotum nearly bare, with blackish scales on sides ; scutellum also bare but its hind margin fringed with white scales. Sides of thorax nearly bare, black, with a few white scales. One comparatively strong black bristle in hind upper corner of mesopleurae.

Wings quite hyaline. Veins darkish, venation of the *T. maculata* type. Costa without small bristles, only haired. Cross-vein *r–m* a little beyond middle of discal cell, distal vein closing this cell S-shaped, without an appendix ; this cell has a broadly rounded lower external angle and a right angle between the veins r_5 and the just-mentioned S-shaped vein, the apical part of r_2 forms a distinct angle with the preceding part, nearly straight, not strongly curved towards costa as in the *T. maculata* group. The basal part of r_4 forms a right angle with r_5 and with its apical part ; the short vein connecting r_{2+3} and r_4 is quite parallel to the vein r_5 and looks like a basal continuation of vein r_4. Squamae whitish with extremely long and dense white hairs along hind margin. Halteres whitish, with a dark side spot.

Legs black, all coxae, femora, anterior and middle tibiae densely covered with white scales.

Abdomen on upperside with black scales, divided by a very narrow white-scaled, partly interrupted, median stripe. Viewed from above the sides of abdomen are narrowly white-scaled ; viewed in profile the abdomen has white-scaled trapezoidal spots above, in centre similar black ones and below again a white-scaled longitudinal stripe ; underside of abdomen black-scaled but with white-scaled narrow transverse bands at hind margins of sternites.

Length of body 5 mm., of wing 3·5 mm.

Holotype 1 ♀, AFRICA ORIENT. : Arsab, vi–vii. *Katona.*

This species was mentioned by Bezzi (1924, *Bombyliidae Ethiop. Reg.* : 130) but without locality and formal description. The description given above is based on the type which is in the Budapest Museum.

NEW EAST AFRICAN TERMITINAE (ISOPTERA: TERMITIDAE).

By R. M. C. Williams, B.Sc., F.R.E.S.

(*Termite Research Unit, East African Agriculture and Forestry Research Organisation.*)

The following new species of termites of the subfamily Termitinae are described from material in the collection made during 1950–52 in North-East Tanganyika and South-East Kenya by Miss P. B. Kemp, then a member of this unit.

I wish to acknowledge the assistance afforded me by Dr. O. Lundblad in providing me with facilities for the examination of the Sjöstedt collection of termites in the Naturhistoriska Riksmuseet, Stockholm.

Crenetermes umbraticola sp. n. (Fig. 1.)

Imago (*Female*).—Head dark brown, post-clypeus a little paler, pronotum the same colour as the head, other sclerites of thorax and sclerites of abdomen paler brown, coxae pale brown, rest of legs a variable dirty yellow-brown.

Fontanelle situated in a depression which is not clearly bordered and has a surface not or scarcely rougher than the surrounding parts of the head. Post-clypeus with a slightly concave anterior margin, a little more than half as long as wide. Antennae, complete only in the holotype, with 17 segments, segment V about as long as II, IV shorter and III the shortest.

Pronotum with anterior margin drawn forward a little towards the sides, posterior margin emarginate. Posterior margins of meso- and metanota rounded emarginate, the angles so formed each about a right angle, the posterior lateral angles rounded. Wings dusky brown, covered with minute tubercles, mainly four, sometimes five- or three-rayed.

Male not differing superficially from female.

	Holotype (mm.).	Range (mm.).
Length of head to front of post-clypeus	1·28	1·19–1·28
Width of head including eyes	1·46	1·45–1·48
Length of left mandible	0·72	0·72–0·77
Greatest diameter of eye	0·37	0·35–0·37
Greatest diameter of ocellus	0·16	0·16–0·17
Least diameter of ocellus	0·11	0·11–0·12
Distance between ocellus and eye	0·11	0·11–0·14
Width of pronotum	1·37	1·28–1·43
Length of pronotum	0·86	0·85–0·95
Length of fore wing	12·5	12·3–12·5
Length of hind tibia	1·86	1·72–1·88

Measurements of two ♀ and two ♂ alates, queen and king from two colonies.

Soldier.—Head pale reddish-yellow, labrum and antennae a little paler, mandibles dark red-brown beyond the paler bases, pronotum pale yellow, legs and rest of body cream-coloured.

Head from above with sides very slightly convex, narrowing towards the front, not or scarcely constricted in the posterior third; from the side straight or slightly convex above, rarely very slightly concave, the forehead flat. Fontanelle visible from above. Labrum

a little wider in front than at its base, wider in front than long, without emargination of anterior margin, with a wide longitudinal groove running from the posterior to the middle of the anterior margin ; anterior lateral angles pointed, drawn a little forward but not to the side. Antennae with 15 segments, segment V about as long as II, IV shorter and III

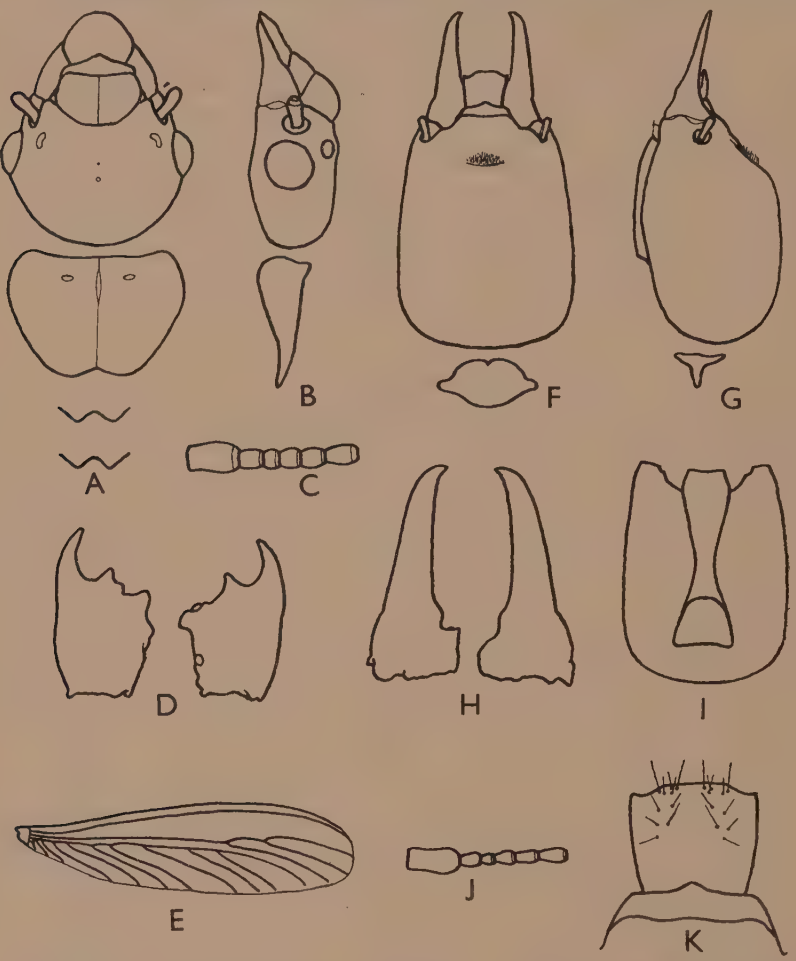


FIG. 1.—*Crenetermes umbraticola* sp. n. A–E, Imago : A, (♀) head, pronotum and posterior margins of meso- and metanota, dorsal aspect ; B, head and pronotum, lateral aspect ; C, basal segments of antenna ; D, mandibles ; E, fore wing. F–K, Soldier : F, head and pronotum, dorsal aspect ; G, the same, lateral aspect ; H, mandibles ; I, head capsule, ventral aspect ; J, basal segments of antenna ; K, labrum and clypeus.

the shortest. Mandibles almost straight as far as the tips, which curve in sharply along the outer margin, lightly along the inner ; the tooth towards the base of each mandible rounded, that on the left the better developed ; right molar area flattened off towards the front, left molar area with front angle sharp, not drawn forward—about a right angle. Gulamentum of nearly even depth, deepest either towards front or back, maximum depth less than minimum width, widening evenly from the front to the part of greatest width.

Anterior margin of pronotum emarginate in the middle.

	Morphotype (mm.).	Range (mm.).
Length of head and mandibles	4·23	4·08–4·37
Length of head to base of mandibles	2·77	2·70–2·85
Width of head	2·03	2·01–2·08
Length of left mandible	1·54	1·46–1·63
Width of pronotum	1·13	1·13–1·25
Length of pronotum	0·53	0·53–0·58
Length of hind tibia	1·54	1·50–1·57

Measurements of 5 specimens from 2 colonies.

Worker.—Head very pale yellow, antennae cream-white proximally, grading to pale yellow distally, legs and rest of body cream-white.

Postclypeus about three-fifths as long as wide, anterior margin slightly concave, strongly inflated, the dorsal outline curving round to meet the head capsule with an outer angle of rather less than a right angle. Fontanelle indistinct, set in a slight concavity of the head. Antennae with 15 segments, segment V as long as or a little shorter than II, IV shorter than V and III the shortest, the division between segments III and IV sometimes very indistinct.

Anterior margin of pronotum not emarginate.

	Morphotype (mm.).	Range (mm.).
Length of head to front of post-clypeus	1·09	1·09–1·21
Width of head	1·23	1·21–1·25
Length of left mandible	0·71	0·67–0·73
Width of pronotum	0·81	0·77–0·85
Length of pronotum	0·36	0·36–0·44
Length of hind tibia	1·25	1·25–1·39

Measurements of 5 specimens from 2 colonies.

The imago of *Crenetermes albotarsalis* Sjöstedt differs in having ocelli distant from the eyes by about their long diameter and meso- and metanota with pointed posterior lateral angles. The soldier of *albotarsalis* differs in having a higher head, with the forehead slightly but clearly projecting forwards above the fontanelle, the sides of the head clearly constricted in the posterior third; mandibles comparatively longer and much less abruptly curved towards the tips along the outer margin, and gulamentum with sides parallel or nearly so at the front, widening abruptly just before the part of greatest width.

Tanganyika: East Usambara, Daluni, 2 ♀ and 2 ♂ alates, 4 soldiers and 5 workers, coll. no. 540, 1.iv.1952 (*P. B. Kemp*).

Kenya: Kwale, queen, king, numerous soldiers and workers, coll. no. 636, 12.vi.1952 (*P. B. Kemp*).

Holotype: ♀ alate. British Museum (Natural History).

Allotype: ♂ alate. B.M. (N.H.).

Morphotypes: Soldier, worker. B.M. (N.H.).

Miss Kemp's field notes are as follows: For no. 540 "*Brachystegia* woodland, red soil on hillside. Small red soil mounds very abundant and most probably *Noditermes* or *Cubitermes*. The typical *Cubitermes* of this area is as no. 541". For no. 636 "Woodland on hill at altitude 1500 ft. In mound with *Cubitermes* no. 631". The two samples of *Cubitermes referred* to have proved to be *Cubitermes umbratus* sp. n.

Cubitermes umbratus sp. n. (Fig. 2.)

Imago.—Head dark red-brown, post-clypeus a little paler, dorsal thoracic sclerites the same colour as the head, lateral and ventral thoracic sclerites paler, outer sides of coxae pale red-brown, inner sides of coxae and rest of legs a variable dirty yellow, abdominal sclerites red-brown, paler than the head.

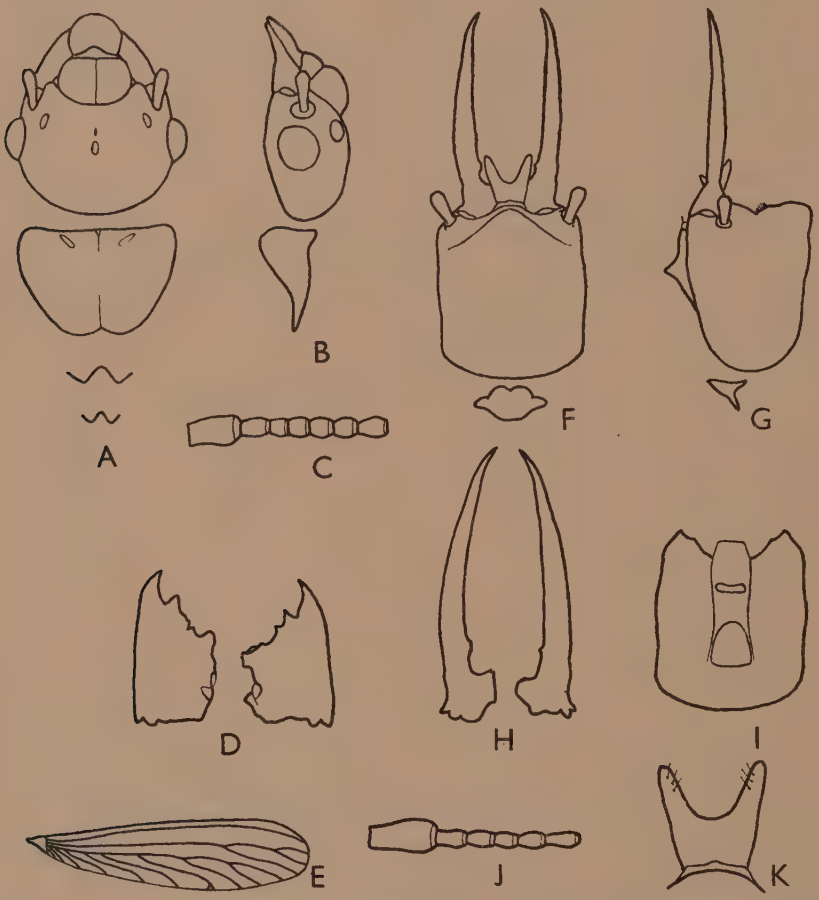


Fig. 2.—*Cubitermes umbratus* sp. n. A–E, Imago: A, (♀) head, pronotum and posterior margins of meso- and metanota, dorsal aspect; B, head and pronotum, lateral aspect; C, basal segments of antenna; D, mandibles; E, fore wing. F–K, Soldier: F, head and pronotum, dorsal aspect; G, the same, lateral aspect; H, mandibles; I, head capsule, ventral aspect; J, basal segments of antenna; K, labrum and clypeus.

Fontanelle situated in a depressed, wrinkled area which is paler than the surrounding parts of the head in the female, not so in the male. Postclypeus with straight or very slightly concave anterior margin, about half as long as its width or a little longer. Antennae complete only in one male alate, with 16 segments, segment V about as long as II, IV a little shorter and III the shortest.

Pronotum very lightly incised in the middle of the anterior margin, posterior margin emarginate. Posterior margins of meso- and metanota obtusely and roundedly emarginate,

the posterior lateral angles of the mesonotum rounded, those of the metanotum more angular. Wings brown, covered with minute 5 or 6-rayed tubercles.

	Holotype (mm.).	Range (mm.).
Length of head	1·32	1·28–1·37
Width of head	1·65	1·61–1·72
Length of left mandible	0·79	0·77–0·85
Greatest diameter of eye	0·46	0·46–0·53
Greatest diameter of ocellus	0·22	0·20–0·22
Least diameter of ocellus	0·15	0·13–0·17
Distance ocellus to eye	0·11	0·10–0·14
Width of pronotum	1·57	1·43–1·63
Length of pronotum	0·91	0·90–1·02
Length of fore wing (1 ♂ alate)		14·5
Length of hind tibia	1·97	1·94–2·04

Measurements of 4 queens, 1 ♀ alate, 1 king and 1 ♂ alate.

Soldier.—Head yellow, darkening slightly towards the front, labrum rather paler, mandible bases the same colour as the front of the head, dark reddish-brown beyond the bases, pronotum pale yellow or cream-coloured as are the legs and rest of the body.

Head with sides narrowing slightly towards the front, very lightly constricted in the posterior third, in some specimens almost imperceptibly; back of head with a central groove, scarcely visible in some specimens, very evident in others where there may be some sinuosity of the back of the head on either side; from the side, head a little concave above, the forehead hardly raised, overhanging the fontanelle. Labrum well chitinised, emarginate in front to a distance of rather less than half the length, wider across the ends of the roundedly blunt forks than long. Antennae with 15 segments, segment V about equal in length to II, IV a little shorter and III the shortest. Mandibles in some specimens curving either a little more or a little less towards the tips than in those figured, the tooth towards the base of the left mandible rounded and about equal in size to that of the right mandible which is flattened; molar areas not drawn forward, that of the left mandible with a pointed anterior angle, that of the right with a rounded one. Gulamentum of nearly even depth, deepest either towards front or back, maximum depth less than minimum width.

Anterior margin of pronotum emarginate in the middle.

	Morphotype (mm.).	Range (mm.).
Length of head and mandibles	4·86	4·72–5·28
Length of head	2·81	2·70–3·00
Width of head	2·13	2·01–2·19
Length of left mandible	2·12	2·12–2·35
Curvature of left mandible	0·38	0·36–0·46
Width of pronotum	1·17	1·13–1·28
Length of pronotum	0·55	0·55–0·64
Length of hind tibia	1·78	1·72–1·97

Measurements of 10 specimens from 4 colonies. The measurement of curvature of the mandible is the greatest distance between the inner margin of the mandible laid flat in a natural position and an imaginary line between the mandible tip and the margin of the molar area (Emerson, 1928, *Bull. Amer. Mus. nat. Hist.* **57**: 507–8).

Worker.—Head, body and legs cream-white.

Postclypeus strongly inflated, from the side the dorsal outline descending to meet the head capsule at about a right angle, length about two-thirds of width. Antennae with 15 segments, segment VII about equal in length to II, segments VI–III shorter and decreasing in length in that order.

Pronotum not or scarcely emarginate in front.

	Morphotype (mm.).	Range (mm.).
Length of head	1·13	1·13–1·19
Width of head	1·25	1·21–1·28
Length of left mandible	0·67	0·67–0·77
Width of pronotum	0·88	0·81–0·88
Length of pronotum	0·42	0·36–0·47
Length of hind tibia	1·35	1·32–1·39

Measurements of 5 specimens from 4 colonies.

Nearest to *Cubitermes intercalatus* Silvestri, which differs in the imago by the presence of a flattening back of the anterior margin of the post-clypeus in the middle which amounts in some specimens to a partial division of the post-clypeus. The soldier of *intercalatus* differs in being larger, with the labrum more deeply emarginate in front and with finer forks, and with mandibles more robust and hook-shaped.

Tanganyika: East Usambara, Daluni, queen, king, 1 ♀ and 1 ♂ alates, 7 soldiers and 23 workers, coll. no. 541, 1.iv.1952 (*P. B. Kemp*).

Amani, Panusi, queen, numerous soldiers, workers and young alate nymphs, coll. no. 15, 11.x.1950 (*P. B. Kemp*); Tanga district, Mwakijembe, queen, numerous soldiers and workers, coll. no. 330, 14.vi.1951 (*P. B. Kemp*); Amani, Magrotto, queen, numerous soldiers and workers, coll. no. 378, 3.i.1952 (*P. B. Kemp*).

Holotype: Queen. British Museum (Natural History).

Allotype: King. B.M. (N.H.).

Morphotypes: Soldier, worker. B.M. (N.H.).

Miss Kemp's field notes are as follows: For no. 541 "*Brachystegia* woodland on red soil hillside. Small mounds abundant, appearing to contain mainly this species, some occupied by *Noditermes* and *Crenetermes*". For no. 15 "Woodland on steep slope. Small mounds very common but a large number not occupied, others invaded by ants or with ants occupying upper regions of mounds". For no. 330 "Red sandy soil with clumps of *Grewia* forming thickets. Mounds common in shade of thickets". For no. 378 "Thicket on cultivated hillside above Tongwe, in two adjacent mounds."

Procubitermes goliathi sp. n. (Fig. 3.)

Soldier.—Head reddish-yellow, darkening a little towards the front, labrum cream-coloured, mandibles very dark red-brown, legs and rest of body cream-white.

Head from above narrowing a little from the middle to the front, slightly constricted in the posterior half, forehead widely rounded; head in profile slightly lowered above

towards the forehead or straight, forehead projecting forwards and overhanging the fontanelle, slightly raised in one specimen. Labrum about as wide in front as long, wider in front than at the base, shallowly and roundedly emarginate in the middle third of the anterior margin, the lateral angles rounded, not or scarcely directed outwards or forwards. Antennae with 14 segments, segments II, III and IV subequal, V a little longer. Mandibles each with a small flattened tooth near the base, with the molar areas each drawn forward into a tooth, that of the right mandible being the smaller and rounded, that of the left the longer and blunt; the left mandible more or less evenly curved, the right a little

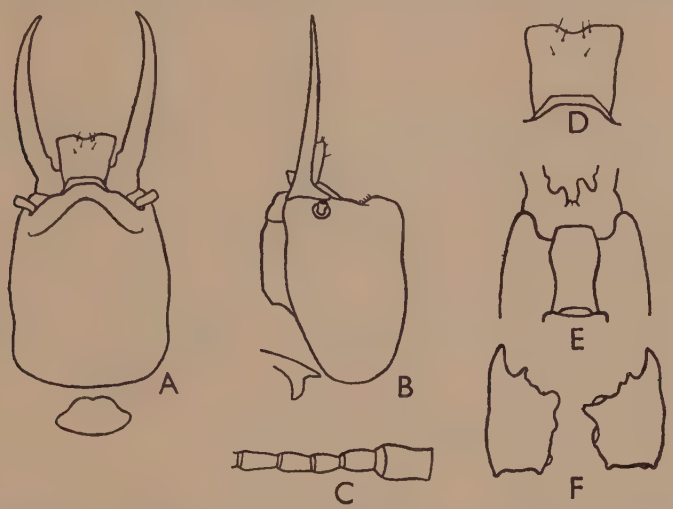


FIG. 3.—*Procubitermes goliathi* sp. n. A–E, Soldier: A, head and pronotum, dorsal aspect; B, the same, lateral aspect; C, basal segments of antenna; D, labrum and clypeus; E, mandible bases and fore part of head capsule, ventral aspect. F, Worker mandibles.

straighter with the middle third or more almost straight along the inner margin and straight or slightly concave along the outer. Gulamentum short, broad and waisted, rounded in cross section and fairly deep, projecting down more or less evenly along its length.

Pronotum with anterior margin emarginate in the middle.

	Holotype (mm.).	Range (mm.).
Length of head and mandibles	2·96	2·74–2·96
Length of head	1·54	1·37–1·54
Width of head	1·25	1·21–1·25
Length of left mandible	1·46	1·43–1·46
Width of pronotum	0·62	0·60–0·62
Length of pronotum	0·33	0·29–0·33
Length of hind tibia	0·88	0·79–0·88

Measurements of 3 soldiers.

Worker.—Head and body cream coloured.

Post clypeus slightly inflated, as long as or a little longer than half its width. Antennae with 15 segments, segment VI about as long as II or a little shorter, V, IV and III

decreasing in length in that order, or with 14 segments due to absence of any division between segments III and IV when the apparent segment III is rather longer than II.

Pronotum not emarginate anteriorly.

	Morphotype (mm.).	Range (mm.).
Length of head	0·91	0·88–0·95
Width of head	0·95	0·93–1·02
Length of left mandible	0·62	0·58–0·65
Length of hind tibia	0·73	0·69–0·75

Measurements of 5 specimens.

Close to *Procubitermes lounsburyi* Silvestri, the soldier of which differs in having mandibles comparatively longer, finer and straighter at the tips, molar area of the right mandible not drawn forward, anterior lateral points of the labrum more acute, the emargination of the anterior margin of the labrum more angular. The soldier of P. *mtwalumi* Fuller, by its description, differs in having the anterior lateral angles of the labrum acute and directed outwards and in having a compartively longer head. The soldier of *P. heterochilus* Silvestri differs in having a shorter head with sides more rounded. Other described soldiers have heads comparatively much longer than in *goliathi*.

Tanganyika : Tanga district, Ngomeni, 3 soldiers and 20 workers, coll. no. 131, 8.ii.1951 (*P. B. Kemp*).

Holotype : Soldier. British Museum (Natural History).

Morphotype : Worker. B.M. (N.H.).

The field notes taken by Miss Kemp are as follows : " Grassland with termite-mound thickets. In an active mound of *Macrotermes goliath*."

Procubitermes planifacies sp. n. (Fig. 4.)

Soldier.—Head lighter or darker reddish-yellow, darkening a little towards the front, mandibles darker than the head, rest of body and legs cream-coloured.

Head from above almost square, with line of forehead rounded in the middle and continued down either side as a blunt ridge bordering the flattened and almost vertical front of the head to the level of the antennal sockets, sides narrowing a little towards the front, slightly constricted in the posterior third ; from the side, head almost straight above with a sharp rise to the rounded forehead which projects forwards very slightly above the fontanelle. Labrum wider in front than long, with rounded anterior lateral angles drawn out a little to the sides ; anterior margin very shallowly emarginate, the emargination involving the whole anterior margin ; sides straight or only very slightly sinuous. Antennae with 14 segments, segment VI about as long as II, III and V of about equal size and a little shorter than VI, IV the shortest. Mandibles lightly curved in the basal third and towards the acute tips, the part between being a little straighter ; left mandible a little more evenly curved than the right which in some specimens is straight along the inner border in the middle region ; the tooth towards the base of the left mandible flattened and smaller than that of the right, which is rounded ; molar area of the right mandible scarcely drawn forward, that of the left drawn forward into a tooth. Gulamentum from below narrowing only slightly towards the rear ; from the side, depth increasing towards the rear and falling off sharply in the posterior quarter, maximum depth about equal to minimum width.

Pronotum with anterior margin flattened in the middle, in some specimens very slightly emarginate.

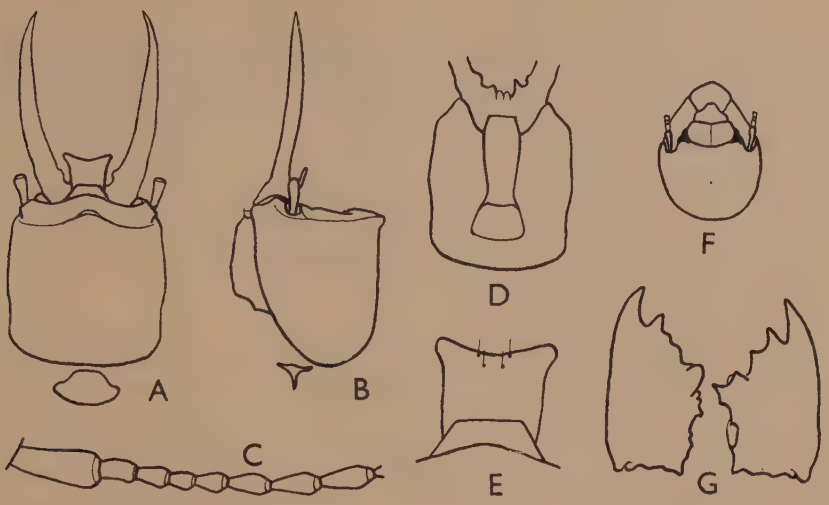


FIG. 4.—*Procubitermes planifacies* sp. n. A–E, Soldier: A, head and pronotum, dorsal aspect; B, the same, lateral aspect; C, basal segments of antenna; D, mandible bases and head capsule, ventral aspect; E, labrum and clypeus. F–G, Worker: F, head, dorsal aspect; G, mandibles.

	Holotype (mm.).	Range (mm.).
Length of head and mandibles	2·59	2·59–2·74
Length of head	1·25	1·25–1·30
Width of head	1·13	1·13–1·20
Length of left mandible	1·43	1·39–1·48
Width of pronotum	0·53	0·50–0·53
Length of pronotum	0·25	0·24–0·25
Length of hind tibia	0·85	0·85–0·91

Measurements of 5 soldiers from 2 colonies.

Worker.—Head and body cream-white.

Postclypeus a little more than half as long as wide. Antennae with 14 segments, segments III and V about equal and a little shorter than II, IV the shortest.

	Morphotype (mm.).	Range (mm.).
Length of head	0·77	0·73–0·79
Width of head	0·82	0·81–0·82
Length of left mandible	0·51	0·48–0·52
Length of hind tibia	0·73	0·65–0·81

Measurements of 5 workers from 2 colonies.

Nearest to the description of *Procubitermes mtwalumi* Fuller, the soldier of which differs in being rather larger, in having the labrum with anterior lateral angles pointed and with a sinuate anterior margin, and in having comparatively shorter mandibles, only about as long as the head. The soldier of *P. goliathi* sp. n. differs in having a longer head, labrum with the anterior margin having a

narrower emargination involving only the middle third of the anterior margin, the front of the head not so flat, and the forehead more projecting. All other soldiers of species in which this caste has been described have much longer heads.

Tanganyika : Tanga district, Ngomeni, 4 soldiers and 4 workers, coll. no. 216 1.v.1951 (*P. B. Kemp*).

Tanga district, Mwakijembe, 1 soldier and 6 workers, coll. no. 269, 17. vii. 1951 (*P. B. Kemp*).

Holotype : Soldier. British Museum (Natural History).

Morphotype : Worker. B.M. (N.H.).

The field notes taken by Miss Kemp are as follows : For no. 216 "Margin of woodland and thicket", her notes on the locality reading "An area of bushland on poor grey soil south of the Tanga road. Grassland with gall *Acacia*, termite mound thickets and, to the South, some extensively cut woodland". For no. 269 "*Commiphora* woodland and open ground with a leguminous herb. Bright red dusty soil in woodland, in trench at depth of 16 cm. No nest found."

Noditermes wasambaricus sp. n. (Fig. 5.)

Imago.—Head red-brown, post-clypeus paler, pronotum the same colour as the post-clypeus, other thoracic sclerites varying from a yellow-brown to the colour of the pronotum ; legs yellow-brown, dorsal abdominal sclerites about the same colour as the pronotum, ventral abdominal sclerites yellow-brown.

Head with fontanelle sunk in a cream-coloured oval depression much smaller than the ocelli, smaller and most often narrower in the male than in the female, with a smaller cream-coloured mark in front. Post-clypeus with a straight or slightly concave anterior margin, a little more than half as long as wide, viewed from behind and above clearly shallowly divided anteriorly in the middle. Antennae with 15 segments, segment VII about equal in length to II, VI shorter than VII, V and IV subequal and shorter than VI, III the shortest.

Pronotum with anterior margin entire, posterior margin angularly emarginate. Posterior margins of meso- and metanota roundedly emarginate, the angles so formed a little more or less than right-angles in the female, more obtuse in the male, the posterior lateral angles of the mesonotum bluntly pointed, those of the metanotum rounded. Wings pale brown, covered with minute tubercles apparently with 4 or more rays, the number not easily determinable.

	Holotype (mm.).	Range (mm.).
Length of head	0·91	0·85–0·91
Width of head	1·13	1·02–1·13
Length of left mandible	0·57	0·51–0·57
Greatest diameter of eye	0·27	0·25–0·29
Greatest diameter of ocellus	0·13	0·13–0·16
Least diameter of ocellus	0·10	0·09–0·11
Distance ocellus to eye	0·08	0·06–0·09
Width of pronotum	0·95	0·87–0·95
Length of pronotum	0·58	0·55–0·58
Length of fore wing	10·5	9·8–10·6
Length of hind tibia	1·06	0·99–1·09

Measurements of 1 queen, 4 ♀ alates, 1 king and 4 ♂ alates, from 6 colonies.

Soldier.—Head yellow, darkening a little towards the front, labrum cream-coloured, mandibles with bases the same colour as the front of the head, darkening beyond the molar areas to a very dark red-brown. Thorax, legs and abdomen cream-coloured.

Head from above about as wide in front as at the back, with a distinct outward bulge in the mid region, with an obtusely angular forehead outline rounded at the apex and

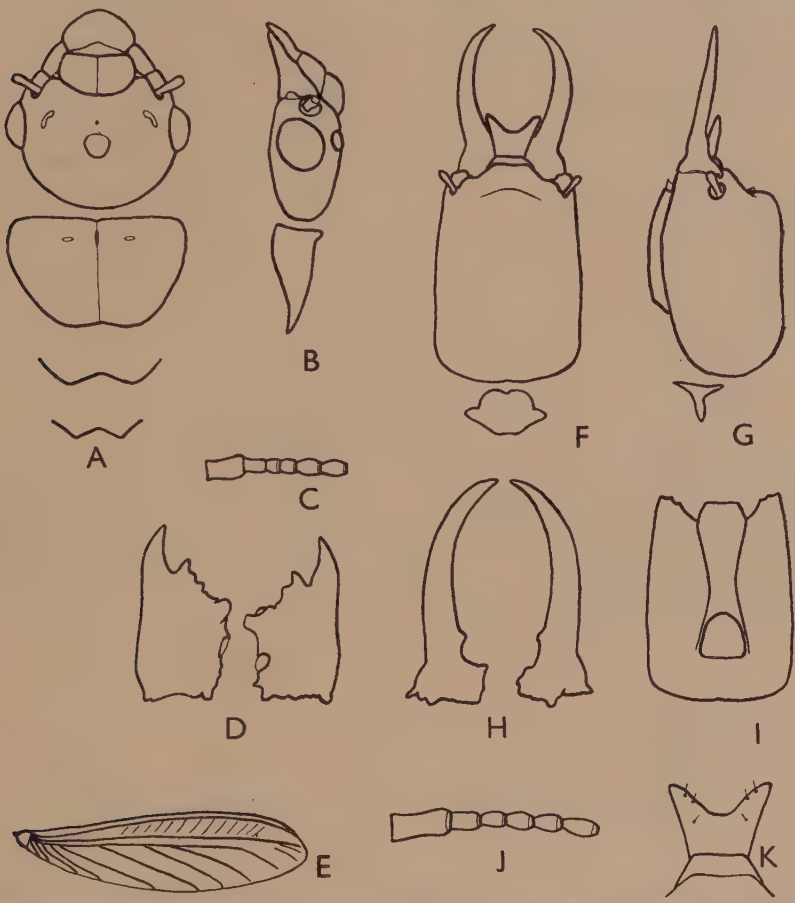


Fig. 5.—*Noditermes wasambaricus* sp. n. A–E, Imago : A, (♀) head, pronotum and posterior margins of meso- and metanota, dorsal aspect ; B, head and pronotum, lateral aspect ; C, basal segments of antenna ; D, mandibles ; E, fore wing. F–K, Soldier : F, head and pronotum, dorsal aspect ; G, the same, lateral aspect ; H, mandibles ; I, head capsule, ventral aspect ; J, basal segments of antenna ; K, labrum and clypeus.

visible almost to the sides of the head ; in profile head generally slightly irregular above, sometimes nearly straight, with a slight rise to the rounded forehead, never markedly concave or convex ; forehead projecting forward to a variable extent above the fontanelle, frons slightly sloping back. Labrum emarginate anteriorly to a distance of rather more than half its length, with forks rounded at the tips. Antennae with 14 segments, segment VI about as long as II, segments V, III and IV shorter, generally decreasing in length in that order, III and V sometimes of equal length. Mandibles slender and nearly straight over most of their length, the left a little more curved in the basal half than the right, the

tips of both very lightly curved in and sharply pointed, the tooth towards the base of the left mandible flattened and larger than that of the right, which is obtusely pointed; right molar area rounded off anteriorly, left slightly drawn forward with front angle bicuspid, the small lower cusp acutely pointed. Gulamentum from below only slightly constricted towards the back; from the side, depth increasing a little from the anterior margin to the node, decreasing more sharply behind the node; node well pronounced, with a square outline viewed from the front, in most specimens with a not very clear indication of lateral bilobality.

Pronotum with anterior margin emarginate in the middle.

	Morphotype (mm.).	Range (mm.).
Length of head and mandibles	2·87	2·63–3·00
Length of head	1·32	1·19–1·39
Width of head	1·17	1·13–1·25
Length of left mandible	1·63	1·46–1·65
Width of pronotum	0·58	0·55–0·58
Length of pronotum	0·22	0·22–0·29
Length of hind tibia	0·85	0·85–0·95

Measurements of 10 soldiers from 6 colonies.

Worker.—Head pale yellow, antennae cream-white or cream-white proximally grading to pale yellow distally, legs and rest of body cream-coloured.

Post-clypeus about two-thirds as long as wide, well inflated, the dorsal outline seen from the side meeting the head capsule behind with an outer angle of about a right angle; with a shallow division anteriorly in the middle and anterior margin very lightly emarginate in the middle. Antennae with 14 segments, segment VI about as long as or a little shorter than II, V, III and IV shorter and decreasing in length in that order.

Pronotum with anterior margin entire.

	Morphotype (mm.).	Range (mm.).
Length of head	0·77	0·75–0·81
Width of head	0·87	0·83–0·91
Length of left mandible	0·47	0·46–0·55
Length of hind tibia	0·73	0·69–0·81

Measurements of 10 specimens from 6 colonies.

The imago of *Noditermes cristifrons* (Wasmann) differs from that of *wasambaricus* sp. n. in having a point-like fontanelle and post-clypeus the same colour as the head capsule; the imago of *curvatus* (Silvestri) is figured in the original description with a comparatively shorter pronotum, only a little more than half as long as wide; the imago of *lamanianus* (Sjöstedt) has the pale fontanelle area much narrower and ocelli rounder and a little further from the eyes. The soldier of *indoensis* Sjöstedt is nearest to that of *wasambaricus* sp.n., differing in having a comparatively longer head, concave above, and mandibles comparatively a little longer; the soldiers of *aburiensis* (Sjöstedt) and *curvatus* (Silvestri) are described as having mandibles more strongly curved and comparatively shorter, about as long as the head, and gulamentum node only a small bump; the soldier of *sinuosus* (Silvestri) has mandibles more strongly curved, only about as long as the head, and gulamentum node a rounded knob; the soldier of *cristifrons* (Wasmann) has a comparatively longer head, concave above, and mandibles

more strongly curved; the soldier of *lamanianus* (Sjöstedt) has mandibles more strongly curved and comparatively a little shorter. In addition the soldiers of all the above species differ from that of *wasambaricus* sp.n. in having foreheads not projecting forward above the fontanelle.

TANGANYIKA: Amani, Panusi, 11 ♂ alates, 38 soldiers, 30 workers and numerous alate and other nymphs, coll. no. 19, 11.x.1950, 10 ♀ alates (*P. B. Kemp*).

Ngomeni, queen, ♀ and ♂ alates, soldiers, workers and alate nymphs, coll. no. 10, 22.ix.1950 (*P. B. Kemp*); Amani, Kizugu, ♀ and ♂ alates, numerous soldiers and workers, coll. no. 68, 3.xi.1950 (*P. B. Kemp*); Mwakijembe, ♀ and ♂ alates, numerous soldiers and workers, coll. no. 400, 13.ii.1952 (*P. B. Kemp*); Handeni, Bagamoyo Road, queen, king, soldiers, workers and 1 soldier nymph, coll. no. 419, 8.iii.1952 (*P. B. Kemp*); KENYA: Kwale, queen, soldiers, workers, alate and soldier nymphs, coll. no. 633, 12.vi.1952 (*P. B. Kemp*).

Holotype: ♀ alate. British Museum (Natural History).

Allotype: ♂ alate. B.M. (N.H.).

Morphotypes: Soldier, worker. B.M. (N.H.).

Miss Kemp's field notes are as follows: For no. 19 "Small mounds common in woodland". For no. 10 "Acacia grassland. Small mounds within clumps of thicket". For no. 68 "Small mounds common in thicket on hillside below road. A mound adpressed against the decaying heart-wood of a large tree (*Albizzia sp.*)". For no. 400 "Nests resembling those of adjacent *Cubitermes* in woodland and thicket near the Umba River. Tall shady trees and leaf litter with little or no undergrowth". For no. 419 "About 18 miles south of Handeni. Forest thicket without undergrowth; in dense shade with deep plant litter, in small mound 18 in. × 3 in." For no. 633 "Hillside woodland in small mounds".

NUMBER OF ANTENNAL SEGMENTS IN ADULT ACRIDIDAE (ORTHOPTERA).

By Miss J. B. Mason.

(*Anti-Locust Research Centre.*)

Although it was known that adult representatives of different subfamilies of the family Acrididae possessed a different number of antennal segments, this question had not yet been studied on sufficiently extensive material.

The present work is an attempt to investigate the problem of whether the number of antennal segments may be regarded as characteristic for different subfamilies.

Material and Method.

Eight hundred and eighteen genera represented by 1480 specimens of all subfamilies of Acrididae were studied (a list of all the genera and species, with their respective counts, has been deposited in the Anti-Locust Research Centre). As a rule, one male and one female adult of one species from each genus was taken, though in some cases two pairs of a species, or two to three species of a genus were examined. In the case of rare species it was sometimes possible to examine specimens of one sex only.

The segments were counted under a binocular microscope. Great care was taken, while counting, to observe whether some segments were incompletely divided ; in all such cases they were counted as separate segments, because it was found that incomplete division varied within the species. To ensure that no incompletely separated segment was overlooked, the segments were counted from all sides of the antenna. In the most difficult cases, when even a high magnification still gave an unsatisfactory result, the insect was placed into a relaxing box, and the segments were swollen with moisture, which made them easier to distinguish. The majority of incompletely divided segments were found near either the base or the apex of the antenna, but this was not a definite rule, as some were found in the middle. The following examples show how the number of segments were recorded:

Acrida turrita L., which has 20 segments in the male antenna and 19 in the female, has a series of incomplete segments near the base of the antenna (fig. 1, A) ; such segments are shown connected by a plus sign : ♂ 1–3+4+5+6+7–20 ; ♀ 1–3+4+5+6–19.

Dociostaurus maroccanus Thunberg has, in both sexes, 26 segments completely divided (fig. 1, D), and the counts can be shown simply : ♂ 1–26 ; ♀ 1–26.

According to Katiyar (1953) cases of assymetry in the number of segments in the same individual are known. This was noticed in some of the specimens examined, but investigation of such abnormalities was considered beyond the scope of this work.

To find the characteristic number of antennal segments in each subfamily, the mean, standard deviation and standard error were calculated. The results were compared by finding the difference between the means, and by calculating t and P.

The vast collection of Acrididae of the British Museum (Natural History) was used for this work. I wish to thank Dr. B. P. Uvarov for his guidance and help in writing the manuscript, and Dr. V. M. Dirsh for suggesting the problem and for advice during the work.

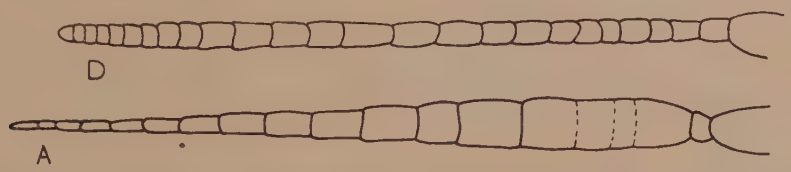


Fig. 1. (A)—Antenna of *Acrida turrita* L. with incompletely divided segments (actual length 31 mm.). (D)—Antenna of *Dociostaurus maroccanus* Thunberg with completely divided segments (actual length 9 mm.).

Number of Antennal Segments in Connection with the Sex.

The ranges of the number of segments in all the subfamilies of Acrididae studied differ very little; sometimes a wider range is observed in the females than in the males and almost always the females have a slightly higher upper range (Table I). This suggested that the males may generally possess a different

Table I.—*Number of antennal segments in each subfamily.* (*Sexes treated separately.*)

Subfamily.		Number of specimens examined.	Range.	Mean ± St. error.	St. dev.
Pyrgomorphinae	♂	45	8–20	15·87 ± 0·37	2.51
	♀	45	7–21	16·13 ± 0·4	2·67
*Charilainae	♂	2	18	18·0	.
	♀	2	17–18	17·5	.
Pamphaginae	♂	36	12–21	16·47 ± 0·4	2·37
	♀	36	12–22	16·75 ± 0·44	2·66
*Trigonopteryginae	♂	2	15–17	16·0	.
	♀	2	18–19	18·5	.
*Ommexechinae	♂	3	17–21	19·33	.
	♀	3	19–23	20·33	.
Oedipodinae	♂	86	16–28	23·33 ± 0·24	2·33
	♀	86	15–30	23·74 ± 0·26	2·42
*Egnatiinae	♂	5	22–25	23·6	.
	♀	5	23–25	24·5	.
Acridinae	♂	152	11–27	22·03 ± 0·22	2·85
	♀	152	12–28	22·46 ± 0·24	3·13
*Pauliniinae	♂	2	19–23	21·0	.
	♀	2	19–23	21·0	.
Catantopinae	♂	295	14–32	23·62 ± 0·14	2·57
	♀	295	14–33	24·14 ± 0·17	2·73

* The standard deviation and standard error were not calculated for the subfamilies, marked with an asterisk, with a small number of genera.

number of segments from the females. However, when the differences between means of the sexes were calculated for the five main subfamilies, they were found statistically not significant (Table II). Thus, while in some species there may be sexual dimorphism, a general rule is that the sexes do not differ significantly in the number of antennal segments. This made it possible to treat the sexes together and more data could be used for every subfamily.

TABLE II.—*The difference between the means of the number of antennal segments in sexes.*

Subfamily.	Difference between means. ♀–♂	d. f.	*t.*	P.
Pyrgomorphinae . .	0·26	88	0·48	>0·6
Pamphaginae . . .	0·28	70	0·47	>0·6
Oedipodinae . . .	0·41	170	1·14	>0·1
Acridinae	0·43	302	1·23	>0·2
Catantopinae . . .	0·52	588	2·36	>0·02

NUMBER OF SEGMENTS IN SUBFAMILIES.

The frequency distribution of the numbers of antennal segments of the subfamilies, counting sexes together, is shown in Table III. The range of segments in the whole of the Acrididae varies between 7 and 33. Pyrgomorphinae have the lowest number of segments, with a range between 7 and 21. Pamphaginae, of which a smaller number of specimens was studied, have a range between 12 and 22. The range in Oedipodinae varies between 15 and 30, while in Acridinae it is from 10 to 28. Catantopinae have between 14 and 33 segments, but such a wide range may be due to the heterogeneous composition and very large size of this largest subfamily (in one species, *Tropidostethus bicarinatus* Phil., there are only 8 segments, but its taxonomic position is uncertain and it was not included).

The average number of segments in Pyrgomorphinae and Pamphaginae is approximately 16, while the average number in Catantopinae, Acridinae, and Oedipodinae varies between 22 and 23 (Table IV and fig. 2).

Differences between the subfamilies were next analysed. Table V shows that the differences between Catantopinae and Acridinae, and between Acridinae and Oedipodinae were highly significant. On the other hand, the difference between the means of Catantopinae and Oedipodinae was not significant. The difference between Pyrgomorphinae and Pamphaginae showed a low significance. When Catantopinae, Acridinae and Oedipodinae were compared with Pyrgomorphinae and Pamphaginae, the pairs proved to differ to a highly significant degree ($P < 0{\cdot}001$).

The result of the statistical analysis showed that the means of antennal segments in each of the subfamilies are significantly different from one another, except in the case of Oedipodinae and Catantopinae. (This will be discussed later, p. 236.)

It will also be clearly seen that the subfamilies fall into two major groups; the group with about 16 segments comprises Pyrgomorphinae and Pamphaginae as well as Charilainae and Trigonopteryginae, while the other consists of

TABLE III.—*Frequency distribution of antennal segments.*

Number of antennal segments.	Pyrgomorphinae.		Charilainae.	Pamphaginae.		Trigonopteryginae.	Ommexechinae.	Oedipoidinae.		Egnatiinae.	Acridinae.		Paulinliinae.	Catantopinae.	
	Number of specimens.	%	Number of specimens.	Number of specimens.	%	Number of specimens.	Number of specimens.	Number of specimens.	%	Number of specimens.	Number of specimens.	%	Number of specimens.	Number of specimens.	%
7	1	0·9	.	.	.	.	.	.	.	.	.	.	.	.	.
8	1	0·9	.	.	.	.	.	.	.	.	.	.	.	.	.
9	1	0·9	.	.	.	.	.	.	.	.	.	.	.	.	.
10	1	0·9	.	.	.	.	.	.	.	.	1	0·3	.	.	.
11	3	2·8	.	.	.	.	.	.	.	.	1	0·3	.	.	.
12	0	0	.	3	3·7	.	.	.	.	.	2	0·6	.	.	.
13	12	11·3	.	9	11·0	.	.	.	.	.	3	0·9	.	.	.
14	2	1·9	.	4	4·9	.	.	.	.	.	0	0	.	3	0·4
15	9	8·5	.	8	9·8	1	.	2	1·1	.	1	0·3	.	2	0·3
16	27	25·5	.	14	17·1	.	.	2	1·1	.	6	1·7	.	2	0·3
17	18	17·0	1	8	9·8	1	1	1	0·5	.	6	1·7	.	5	0·7
18	17	16·0	3	15	18·3	1	.	1	0·5	.	14	4·0	.	9	1·2
19	8	7·5	.	9	11·0	1	2	3	1·6	.	33	9·5	2	24	3·2
20	5	4·7	.	9	11·0	.	1	12	6·4	.	27	7·8	.	35	4·6
21	1	0·9	.	2	2·4	.	1	14	7·5	.	32	9·2	.	45	6·0
22	.	.	.	1	1·2	.	.	23	12·3	1	40	11·5	.	76	10·1
23	.	.	.	.	.	.	1	31	16·5	3	51	14·6	2	133	17·6
24	.	.	.	.	.	.	.	36	19·3	1	46	13·2	.	140	18·5
25	.	.	.	.	.	.	.	29	15·5	5	37	10·6	.	106	14·0
26	.	.	.	.	.	.	.	18	9·6	.	33	9·5	.	70	9·3
27	.	.	.	.	.	.	.	9	4·8	.	10	2·9	.	44	5·8
28	.	.	.	.	.	.	.	5	2·7	.	5	1·4	.	37	4·9
29	.	.	.	.	.	.	.	0	0	.	.	.	.	14	1·9
30	.	.	.	.	.	.	.	1	0·5	.	.	.	.	4	0·5
31	.	.	.	.	.	.	.	.	.	.	.	.	.	4	0·5
32	.	.	.	.	.	.	.	.	.	.		.	.	1	0·1
33	.	.	.	.	.	.	.	.	.	.	.	.	.	1	0·1

TABLE IV.—*The range and average number of antennal segments in each subfamily. (Sexes treated together.)*

Subfamily.	Number of specimens.	Range.	Mean ± St. error.	St. dev.
Pyrgomorphinae . .	106	7–21	16·07 ± 0·25	2·57
Charilainae . . .	4	17–18	17·75	.
Pamphaginae . . .	82	12–22	16·76 ± 0·26	2·45
Trigonopteryginae .	4	15–19	17·0	.
Ommexechinae . .	6	17–23	19·83	.
Oedipodinae . .	187	15–30	23·41 ± 0·18	2·46
Egnatiinae . . .	10	22–25	24·0	.
Acridinae . . .	348	10–28	22·24 ± 0·16	3·08
Pauliniinae . . .	4	19–23	21·0	.
Catantopinae . .	755	14–33	23·78 ± 0·10	2·66

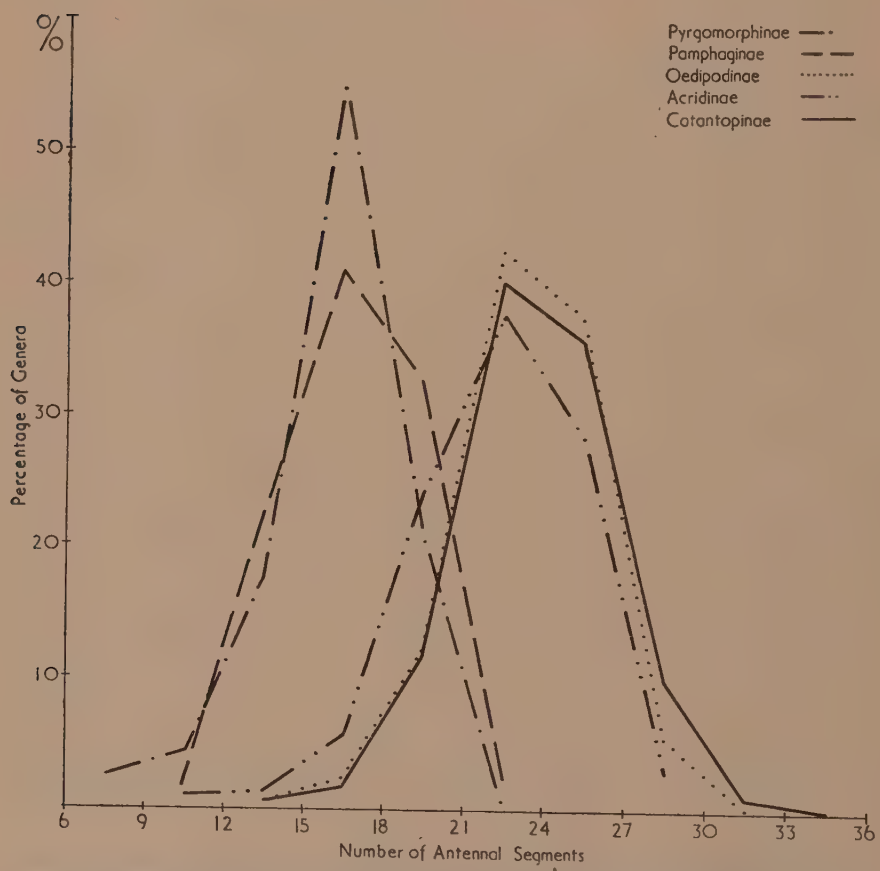


FIG. 2.—Distribution of antennal segments in the five main subfamilies of Acrididae.

TABLE V.—*The comparison of means of the subfamilies.*

Subfamily.	Difference between means.	d. f.	t.	P.
Catantopinae . . . Acridinae	1·54	1101	8·6	<0·001
Catantopinae . . . Oedipodinae . . .	0·37	940	1·8	<0·1
Acridinae . . . Oedipodinae . . .	1·17	533	4·5	<0·001
Pamphaginae . . . Pyrgomorphinae . .	0·69	186	1·87	>0·05
Catantopinae . . . Pyrgomorphinae . .	7·71	859	28·56	<0·001
Catantopinae . . . Pamphaginae . . .	7·02	835	22·65	<0·001
Acridinae . . . Pyrgomorphinae . .	6·17	452	18·69	<0·001
Acridinae . . . . Pamphaginae . . .	5·48	428	18·0	<0·001
Oedipodinae . . . Pyrgomorphinae . .	7·34	291	24·47	<0·001
Oedipodinae . . . Pamphaginae . . .	6·65	267	20·78	<0·001

Catantopinae, Acridinae, Oedipodinae, and Egnatiinae with about 22 segments (Table IV). The position of Ommexechinae with 19 segments appears intermediate between the two groups. Pauliniinae with only two genera, which have between 19–23 segments, is of indefinite position.

NUMBER OF SEGMENTS AND WING DEVELOPMENT.

Preliminary observations have shown that fully winged, short winged and wingless species within the same subfamily possessed a different number of antennal segments. It was thought possible that the difference between the subfamilies may reflect the proportion in them of specimens with full wing, short wing and no wing.

To study the number of antennal segments in relation to the length of the wing, it was necessary first to classify specimens according to wing development. This presented a problem, as the wings varied from fully developed to none. The fully winged (macropterous) and wingless (apterous) types could definitely be determined, but the intermediate stages were conditionally placed into two groups, namely, brachypterous specimens, with the wings present but much shorter than the abdomen (when the elytra were closed, the metathorax could not be seen dorsally), and the micropterous group, with very small lobiform lateral elytra. Some specimens were difficult to classify into the correct wing group as it was possible to place them into either of the two latter groups. Male and female specimens which differed sometimes in wing development were referred to the respective wing groups. In a few species all degrees of wing development were present; these were placed into the wing group of the counted specimen.

Table VI gives the number of specimens in each group. The macropterous and micropterous groups were the largest. In the subfamily Oedipodinae over

95 per cent. of the specimens were macropterous, with the brachypterous and micropterous groups having only four specimens each and no species being completely apterous. Acridinae also have a large percentage of macropterous specimens with the apterous group being represented by only one species (*Dysanema irvinei* Uvarov).

TABLE VI.—*The number of specimens in each wing group of the five main subfamilies.*

	Macropterous.		Brachypterous.		Micropterous.		Apterous.	
Subfamily.	Number of specimens.	%.	Number of specimens.	%.	Number of specimens.	%.	Number of specimens.	%.
Pyrgomorphinae.	41	38·68	12	11·32	31	29·25	22	20·75
Pamphaginae .	28	34·15	4	4·88	36	43·9	14	17·07
Oedipodinae .	179	95·22	4	2·14	4	2·14	.	.
Acridinae .	272	78·16	34	9·77	41	11·78	1	0·29
Cantantopinae .	427	56·56	63	8·34	188	24·9	77	10·2

Table VII and fig. 3, show that the average number of antennal segments in each wing group of the same subfamily tends to decrease with the reduction of wings, the apterous specimens having the least number of segments. This was found in every subfamily except Pyrgomorphinae in which the average for

TABLE VII.—*The average number of antennal segments in each wing group.*

Subfamily.		Macropterous.	Brachypterous.	Micropterous.	Apterous.
Pyrgomorphinae	Number of specimens	41	12	31	22
	Range	11–21	13–19	13–20	7–17
	$x \pm Sx$	$17{\cdot}02 \pm 0{\cdot}32$	$15{\cdot}25 \pm 0{\cdot}70$	$16{\cdot}58 \pm 0{\cdot}35$	$14{\cdot}0 \pm 0{\cdot}66$
	s	2·04	2·42	1·95	3·09
Pamphaginae .	Number of specimens	28	4	36	14
	Range	13–22	16–20	12–21	12–18
	$x \pm Sx$	$18{\cdot}14 \pm 0{\cdot}40$	$18{\cdot}0 \pm 0{\cdot}91$	$16{\cdot}33 \pm 0{\cdot}37$	$14{\cdot}71 \pm 0{\cdot}57$
	s	2·12	1·83	2·20	2·13
Oedipodinae .	Number of specimens	179	4	4	.
	Range	15–30	22–25	16–21	.
	$x \pm Sx$	$23{\cdot}51 \pm 0{\cdot}18$	$23{\cdot}0 \pm 0{\cdot}71$	$19{\cdot}0 \pm 1{\cdot}22$	.
	s	2·39	1·41	2·45	.
Acridinae .	Number of specimens	272	34	14	1
	Range	10–28	16–27	12–26	19
	$x \pm Sx$	$22{\cdot}52 \pm 0{\cdot}18$	$22{\cdot}41 \pm 0{\cdot}48$	$20{\cdot}27 \pm 0{\cdot}51$	19·0
	s	2·98	2·82	3·27	.
Catantopinae .	Number of specimens	427	63	188	77
	Range	16–32	18–33	14–27	14–26
	$x \pm Sx$	$24{\cdot}74 \pm 0{\cdot}12$	$23{\cdot}79 \pm 0{\cdot}30$	$22{\cdot}62 \pm 0{\cdot}17$	$21{\cdot}2 \pm 0{\cdot}26$
	s	2·40	2·35	2·31	2·27

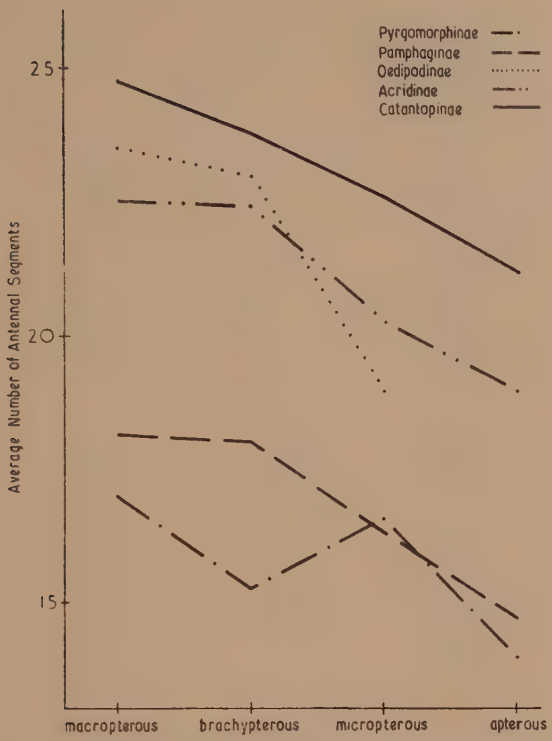


FIG. 3.—Distribution of the average number of antennal segments in the wing groups of the five main subfamilies of Acrididae.

the brachypterous group was smaller than for the micropterous. This may be due to specimens being inaccurately placed in the wing group, as in this subfamily some wings were difficult to classify correctly.

The uneven distribution of specimens in the wing groups must be considered when comparing the means of the subfamilies because the averages differ in each wing group. Particular notice must be drawn to Oedipodinae as 95 per cent. of the specimens were fully winged. As previously mentioned, the difference between the means of Catantopinae and Oedipodinae is 0·37, t being 1·8, and the probability very low ($P < 0{\cdot}1$); this result may reflect the uneven number of specimens in the wing groups of the two subfamilies.

Therefore, in order to find the difference between the averages of Catantopinae and Oedipodinae, the difference between the means of the macropterous specimens only was analysed (Table VIII, fig. 4); t was 5·86 and the probability highly significant ($P < 0{\cdot}001$). When Oedipodinae and Acridinae were compared in the same manner, t was 3·67 and the probability highly significant ($P < 0{\cdot}001$). The differences between the macropterous ($P < 0{\cdot}001$), brachypterous ($P < 0{\cdot}01$) and micropterous ($P < 0{\cdot}001$) groups of Catantopinae and Acridinae were also significant. A comparison of the wing groups in Catantopinae with Pyrgomorphinae and Pamphaginae showed in every case a very high significance ($P < 0{\cdot}001$).

TABLE VIII.—*The difference between means of the wing groups.*

	Difference between means.	d. f.	*t.*	P.
Pamphaginae				
Pyrgomorphinae				
Macropterous .	1·12	67	2·24	$< 0·05$
Brachypterous	2·75	14	2·08	$> 0·05$
Micropterous .	0·25	65	0·49	$> 0·6$
Apterous .	0·71	34	0·76	$< 0·5$
Catantopinae				
Pyrgomorphinae				
Macropterous .	7·72	466	19·70	$< 0·001$
Brachypterous	8·54	73	11·39	$< 0·001$
Micropterous .	6·04	217	13·72	$< 0·001$
Apterous .	7·2	97	12·0	$< 0·001$
Catantopinae .				
Pamphaginae				
Macropterous .	6·6	453	14·04	$< 0·001$
Brachypterous	5·79	65	4·82	$< 0·001$
Micropterous .	5·29	222	12·6	$< 0·001$
Apterous .	6·49	89	9·98	$< 0·001$
Catantopinae .				
Acridinae				
Macropterous .	2·22	697	11·1	$< 0·001$
Brachypterous	1·38	95	2·58	$< 0·01$
Micropterous .	2·35	227	5·47	$< 0·001$
Catantopinae .				
Oedipodinae				
Macropterous .	1·23	604	5·86	$< 0·001$
Oedipodinae				
Acridinae				
Macropterous .	0·99	449	3·67	$< 0·001$

Non-significant differences were found between Pamphaginae and Pyrgomorphinae in the micropterous ($P > 0·6$) and apterous specimens ($P < 0·5$); a low significance was found between the macropterous ($P < 0·05$) and brachypterous group ($P > 0·05$).

It is evident from Table VIII that the differences between the averages of the same wing groups in all subfamilies are highly significant, except in the case of Pyrgomorphinae and Pamphaginae, where these averages are insignificant or have a low significance. The importance of the number of specimens in each wing group, when comparing the averages of the subfamilies, can be seen from the difference of averages of the two subfamilies (Cantantopinae and Oedipodinae) being insignificant, while the results of the difference of the macropterous groups are highly significant. The small number of specimens in the other three wing groups of Acridinae and Oedipodinae prevented comparison.

CONCLUSIONS.

1. The number of antennal segments in 818 genera represented by 1480 specimens of all the subfamilies of Acrididae from the world fauna were studied.

2. By statistical analysis it was found that every subfamily of Acrididae possessed a characteristic average number of antennal segments which is

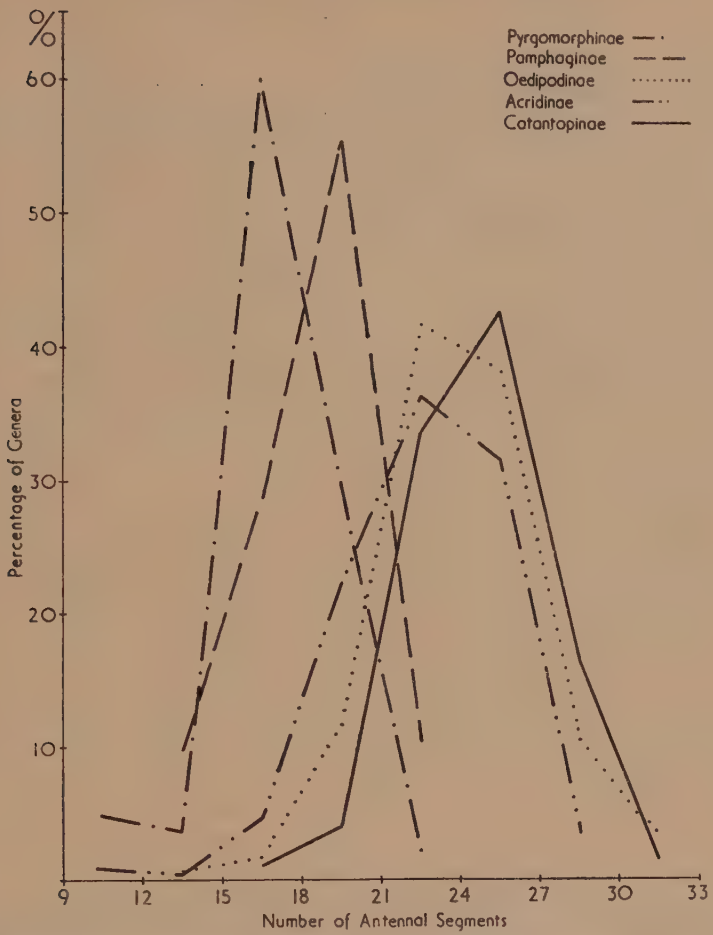


FIG. 4.—Distribution of antennal segments in the macropterous groups of the five main subfamilies of Acrididae.

significantly, or highly significantly, different from that of the other subfamilies, but the frequency distribution curves of all subfamilies overlap.

3. The differences between the average number of antennal segments of the sexes in all subfamilies were found insignificant.

4. The average number of antennal segments calculated for each subfamily shows that Acrididae can be divided into two major groups. The averages of the first group are 16–17 (in Pamphaginae 16·76 $\pm$ 0·26, in Pyrgomorphinae 16·07 $\pm$ 0·25, in Charilainae 17·75 and in Trigonopteryginae 17·0). The averages of the second group are 22–24 segments (in Catantopinae 23·78 $\pm$ 0·10, in Oedipodinae 23·41 $\pm$ 0·18, in Acridinae 22·24 + 0·16, in Egnatiinae 24·0). Ommexechinae with only three genera may be classed as an intermediate group with an average of 19·83 segments. Pauliniinae with only two genera which have 19–23 segments are indefinite and cannot be placed into the mentioned groups. Differences between the means were calculated for pairs of the

five main subfamilies, and proved to be highly significant, except in the cases of Pyrgomorphinae and Pamphaginae ($P > 0{\cdot}05$), Catantopinae and Oedipodinae ($P < 0{\cdot}1$).

5. The connection between the number of antennal segments and degree of wing development (in adults) was investigated. The average number of antennal segments decreased regularly with the shorter wing. The macropterous specimens had the largest and the apterous specimens had the smallest number of segments (except the subfamily Pyrgomorphinae where the micropterous specimens had a higher average than the brachypterous specimens, which was probably due to the difficulty of placing the wings to the correct group).

6. The differences between the means of the wing groups were calculated. In the comparison of the same wing groups of Catantopinae with Pyrgomorphinae and Pamphaginae the difference was highly significant. The difference between the macropterous groups of Catantopinae and Oedipodinae was also highly significant ($P < 0{\cdot}001$). It may be concluded from this that the average number of antennal segments in each subfamily is partly determined by the number of specimens of each wing group.

7. Pyrgomorphinae and Pamphaginae have a higher percentage of micropterous and apterous specimens than the other subfamilies, and the average number of antennal segments of Pyrgomorphinae and Pamphaginae is much lower (approximately 16) than in the other subfamilies (approximately 22–23). Nevertheless, these two subfamilies generally have a smaller number of segments than Catantopinae, Acridinae and Oedipodinae. Therefore, although Pyrgomorphinae and Pamphaginae have a lower average number of segments, this is not due to the larger percentage of specimens in the micropterous and apterous groups, and may be regarded as a taxonomic character.

Reference.

Katiyar, K. N., 1953, Variation and post-embryonic growth in the number of antennal segments in three species of Indian short-horned grasshoppers (Orthoptera : Acridoidae) together with observations on the number of segments in adult Acrididae based on the collections at the Forest Research Institute, Dehra Dun. *Agra Univ. J. Res.* (*Sci.*). **2** : 331–356.

FAUNE FRANÇAISE DES COLLEMBOLES (V). COLLEMBOLES RECOLTÉS EN CORSE PAR MISS T. CLAY.

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On sait fort peu de choses sur la faune des Collemboles du Sud-Est de la France ; la Corse, malgré quelques travaux récents, n'est guère mieux connue à cet égard. Le matériel récolté au mois de septembre 1953 dans cette ile par Miss Theresa Clay comprend dix especes réparties entre quatre stations. Ces especes, dans l'ensemble, présentent peu d'intêret, sauf toutefois une espece nouvelle d'*Hypogastrura* décrite à la fin de ce travail. Nous avons donc trouvé : Corsica.—Calvi, under stone in bog, ix.53 : *Lepidocyrtus cyaneus* Tullberg ; ants' nests under stones : *Cyphoderus albinus* Nic. ; in rotting seaweed : *Isotoma maritima* Tullberg.

Bonifato, under hollytrees : *Isotoma notabilis* Schaeffer, *Isotomiella minor* (Schaeffer), *Folsomia penicula* Bagnall, *Orchesella quinquefasciata* Bourlet, *Achorutes longisetus* Caroli, *Hypogastrura tergilobata* sp. n., *Xenylla maritima* Tullberg, *Arrhopalites* juv. indeterminable.

Hypogastrura tergilobata sp. n.

Longueur : 1 à 1,2 mm.; habitus d' *H. armata ;* brun gris moucheté, grain tégumentaire faible et homogène sur toutes les parties du corps ; chétotaxie faite de soies généralement longues, surtout dans la région posterieure, les plus longues soies du dernier segment abdominal subégales aux épines anales.

Antennes banales d'*Hypogastura*, présentant un sac évaginable entre les deux derniers articles ; organe antennaire III de type hypogastrurien ; A 4 pourvu à l'apex d'une massue trilobée, portant en outre une dizaine de soies sensorielles allongées et une vingtaines de poils sensoriels courts et recourbés en crochet.

8 + 8 yeux égaux ; organe postantennaire quadrilobé de type *armata* pourvu d'un élément basal autonome (fig. E) ; pièces buccales bien développées.

Griffe allongée pourvue d'une forte dent interne et de deux latérales moins développées et plus proximales ; appendice empodial à lamelle très développée, présentant un apex sétiforme qui dépasse largement le milieu de la griffe. Un ergot net, subégal, à la créte interne de celle-ci (fig. B).

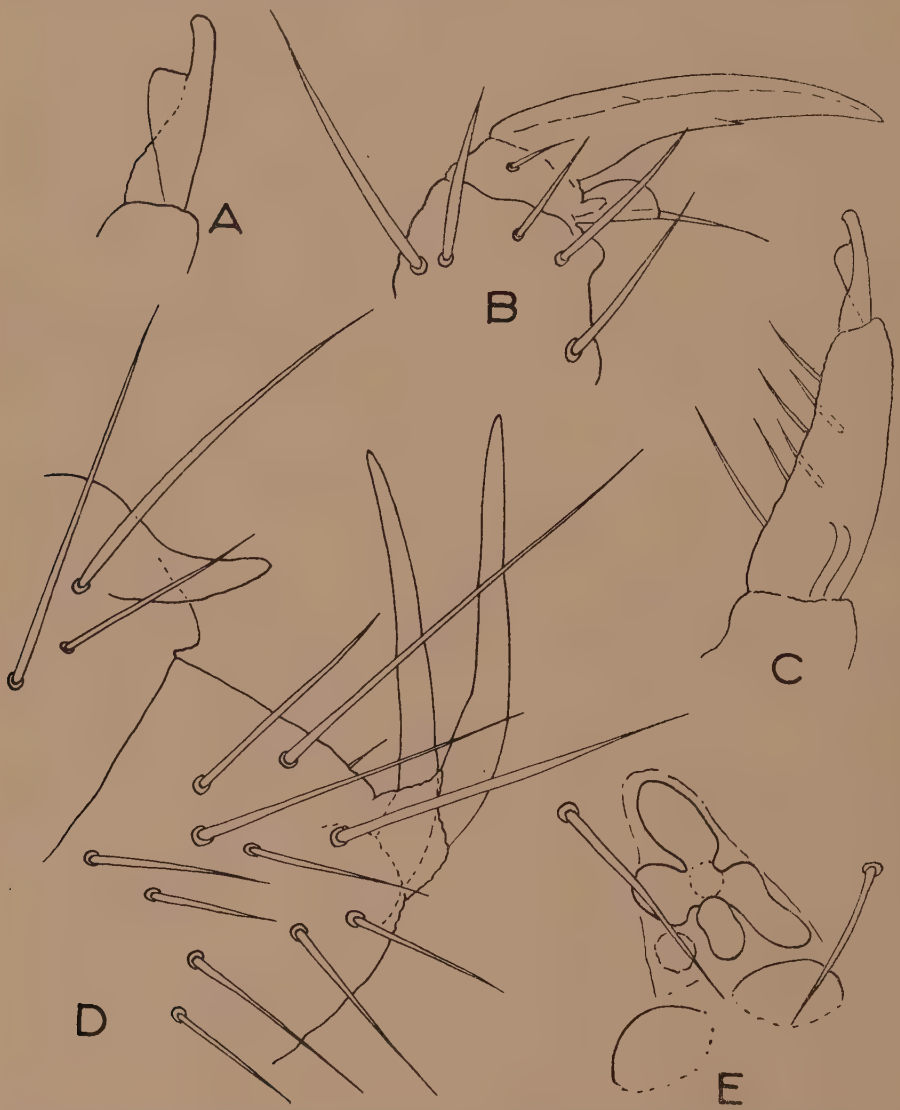
Tube ventral portant 4 + 4 soies ; furca bien développée, dens pourvue de six soies d'égale épaisseur, mucron de structure *armata*. (fig. A, C) ; Antenne : épine anale : griffe de PIII : dens mucron = 20 : 10 : 4,5 : 6 : 2,5. Rétinacle portant 4+4 dents, sans soie au corpus.

5° segment abdominal portant dans l'axe une languette impaire chitinisée mais souple, de forme bien définie, flanquée de deux soies (fig. D et F). Epines anales très longues, égales environ à deux fois la griffe de PIII, sur des papilles séparées. Ces épines très élancées vont en s'amincissant progressivement vers l'apex (fig. D et F).

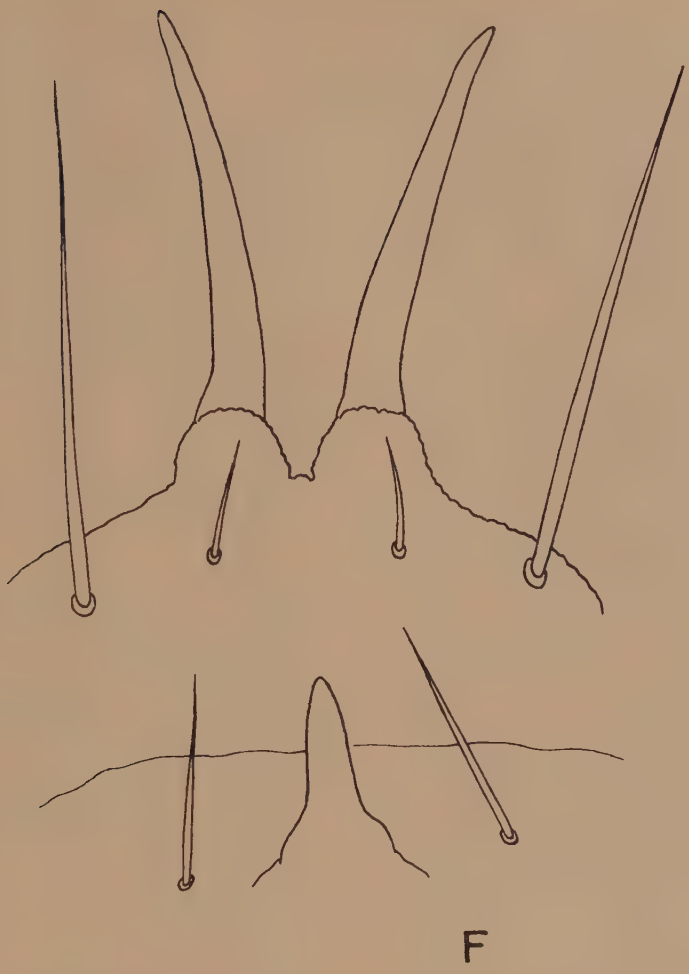
Affinités, répartition : Proche par de nombreux caractères des espèces du groupe *armata*, cet animal est cependant trés facile à séparer de celles-ci par la curieuse excroissance tégumentaire d'Abd. 5 et par ses épines anales extraordinairement développées.

Je connaissais déjà cette intéressante espèce d'Espagne du Sud, grâce au nombreux matériel récolté en Andalousie par le Professeur W. Kuhnelt. Mais ne disposant que d'individus, certes nombreux mais tous juvéniles, je n'avais pas jugé oportun d'en donner la description. Les exemplaires corses m'en ont donné l'occasion.

Holotype et Paratype, Corsica : Bonifato, under hollytrees. ix.1953, 2 ex. Holotype dans les collections du British Museum (Natural History) (1953 : 613). Paratype dans ma collection.



Hypogastrura tergilobata sp. n.—A, mucron ; B, griffe de PIII ; C, dens et mucron ; D, epines anales et lobe dorsal de Abd. IV ; E, organe postantennaire et deux cornéules ; F, extremité de l'abdomen, vue dorsale.



F

Localités espagnoles : Sierra Bermeja, La Hanadilla, 1020 m., iii.1952. Grazalema (Ronda), sous *Quercus suber*, *Cistus*, *Q.? lusitanica*. iii.1952.

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